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PESTICIDES ABSTRACTS

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U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES AND TOXIC SUBSTANCES
MANAGEMENT SUPPORT DIVISION
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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstracts Bulletin) is a monthly publication of the Management Support Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commerical materials, equipment, or processes mentioned therein.

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81-3301. Mansour, F.; Rosen, D.; Shulov, A.; Plaut, H. N. (Div. Entomol., ARO, Newe Ya'ar, Haifa, Israel) **Evaluation of spiders as biological control agents of *Spodoptera littoralis* larvae on apple in Israel.** *Acta Oecol. Oecol. Appl.* 1(3): 225-232; 1980 (32 references).

The effectiveness of spiders in a biological control system of the larvae of the Egyptian cotton leafworm, *Spodoptera littoralis* (Boisd.) was investigated in an apple orchard ecosystem. Laboratory-reared egg masses of *S. littoralis* were used to infest 6 apple trees in an untreated orchard. Spiders were carefully eliminated from 3 of the 6 trees. On the other 3 trees, existing spiders were allowed to remain. Larval populations of *Spodoptera* did not develop to damaging proportions on trees containing spiders. Damage was significant to those trees from which the spiders had been removed.

81-3302. Herdi, F. (Res. Inst. Plant Prot., Budapest, Hungary) **The dicamba-induced damage in the petiole of the beetroot (*Beta vulgaris* L. convar. *conditiva* Alef.).** *Acta Phytopathol. Acad. Sci. Hung.* 14(3-4): 409-417; 1979 (8 references).

Studies were conducted to determine the effects of the herbicide dicamba on beetroot plants. Dicamba was applied at rates of 10, 100, and 1000 ppm on May 20, 1977. The plants were sampled on June 6, 13, and 20, and the petioles were fixed in 40% ethanol and prepared for histological examination. The primary effects were thickened walls of bundle sheath and phloem cells, and the deformation and the increase in numbers of vascular bundles. Effects were observed at all dicamba concentrations.

81-3303. Krausko, A.; Toth, J. (Coll. Agric., Nitra, Czechoslovakia) **Vplyv Bidisinu EC 50 na niektore vlastnosti jarneho jacmena. [The effect of Bidisin on some characteristics of spring barley.]** *Agrochemia* 21(7): 205-209; 1981 (13 references) (Slovak).

The tolerance of Ametyst, Diabas, Spartan, Koral, Safir and Fatran spring barley strains to contact with the herbicide Bidisin EC 50 (chlorfenprop-methyl) was studied. The mechanical, chemico-technical and nutritional impact on the crop measured by reduction of the dry wt compared with controls were used as a criterion of phytotoxicity. Bidisin was applied to the culture at the dose recommended for controlling wild oats (8 l/ha) at an early growth stage. Bidisin affected the Diabas strain most, and the other strains about equally. These effects were practically identical when 16 l/ha was applied. Bidisin application did not affect the number of grains in the ears, but did reduce germination most markedly in the Diabas strain. Amino acid content was found to be affected more by the weather than by Bidisin application.

81-3304. Miller, S. D.; Nalewaja, J. D. (North Dakota Agric. Exp. Stn., Fargo, ND 58105) **Herbicide antidotes with triallate.** *Agron. J.* 72(4): 662-665; 1980 (12 references).

Antidotes applied to wheat seed or as a spray application with triallate were evaluated for their effectiveness in increasing wheat tolerance to triallate in a glasshouse. R-25788 and 1,8-naphthalic anhydride were applied at doses of 0.12 or 0.5%, 2,2-dimethyl-3-dichloroacetyl- oxazolidine (R-28725) and 4-chloro-2-hydroxyiminoacetanilide (S-449) at 0.06 or 0.25%, and carboxin at 0.3 and 0.6% on the seed wt basis to Waldron wheat seed. R-25788 or R-28725 were applied as a spray at 0.14 kg/ha in combination with triallate. Triallate at 1.1 kg/ha injured wheat plants. Plant growth was inhibited, and the color of the plants changed from green to dark blue-green. Triallate at 2.2 and 3.3 kg/ha reduced plant emergence and stunted growth of emerged plants. R-25788 and NA at both seed treatment doses or carboxin at the low dose reduced injury to wheat from triallate. R-25788 at 0.12 and 0.5% or carboxin at 0.3% reduced wheat injury by 60, 40 and 40%, respectively. Seed treatment with carboxin at 0.6% without triallate reduced wheat growth 18% compared to the untreated wheat. None of the other antidotes caused any injury to wheat. In field experiments, R-25788 or carboxin treatment of wheat seed increased wheat seedling tolerance to preplant applications of triallate.

81-3305. Jones, M. J. (Author address not given) **The spruce-budworm disaster: an integrated approach.** *Am. For.* 6: 17-20, 45; 1980.

The customary approach to reducing budworm populations in Maine and elsewhere in the Northeast has been through the use of widespread aerial spraying. Since the end of World War II, 27 million acres of spruce fir forests in the US and 113 million acres in eastern Canada have been so treated. Such treatment has been only partly successful. Questions about the effect of widespread spraying on human health are being raised. Immediate economic benefits must be weighed against long-term environmental risks. The use of integrated pest management (IPM) programs must be a factor in the future attempts to control this insect pest. IPM is an overall ecological approach to pest management that consolidates available pest control techniques to avoid or reduce economic damage and minimize adverse side effects. Intensive removal of fir in infested stands by selective harvesting, and the interplanting of species that are not susceptible to the budworm, help cut the costs of long-term protection and speed the development of a more stable forest. An integrated method of harvesting and spraying is being tried in Maine on 200,000 acres of land. Biological control through the use of viruses and fungi that are lethal to the budworm are also being investigated, including the use of *Bacillus thuringiensis*, a bacterial pathogen. *B. thuringiensis* does not kill beneficial insects, only the budworm. Future methods may include hormones to regulate budworm growth, and plant extracts and other compounds that act as feeding deterrents.

81-3306. Mason, D. T.; Woodford, J. A. T.; Trudgill, D. L. (Scottish Crop Res. Inst., Invergowrie, Dundee DD2 5DA, Scotland) **The effect of benomyl on some invertebrate inhabitants of a red raspberry, *Rubus idaeus*, plantation in relation to fruit yield.** *Ann. Appl. Biol.* 98(1): 43-51; 1981 (41 references).

Red raspberry plants were treated with repeated applications of the fungicide benomyl, applied at the standard rate of 1.12 kg/ha, and on 3 occasions at 0.56 kg/ha rate. Three applications each were made in June of 1971, 1972, and 1973. No applications were made in 1974 or 1975. All plots were sprayed with dichlofluanid at 2.24 kg AI/ha 3 times in 1974 and again in 1975 to control fruit rots. From 1971 to 1973 benomyl significantly increased fruit yields compared with unsprayed controls. From 1973 to 1975 it was noted that benomyl had increased vegetative growth; a significantly greater weight of thinnings was removed from treated plots. Neither benomyl nor culture methods affected the height of the canes before tipping in February 1974. Benomyl did not significantly increase the number of primocanes tied in 1972 and 1973, when fruit yields were increased by benomyl sprays. In years following benomyl treatment, significantly more canes died from midge blight in the plots treated most frequently with benomyl than in the untreated plots. This resulted from increased infestation by larvae of the raspberry cane midge in the benomyl-treated plots; this was suggested to be due to increased extent of cane splitting caused by benomyl, which increased the number of egg-laying sites for cane midge.

81-3307. Pihakaski, S.; Pihakaski, K. (Dep. Bot., Univ. Turku, SF-20500 Turku 50, Finland) **Effects of glyphosate on ultrastructure and photosynthesis of *Pellia epiphylla*.** *Ann. Bot. (London)* 46(2): 133-141; 1980 (22 references).

Studies were conducted to determine the effects of the herbicide glyphosate on the ultrastructure and photosynthesis of the liverwort *Pellia epiphylla*. The plants were sprayed with 0.22-2.2 mg/dm^2. Samples were collected for electron microscopy examination 1 day and 2 wk after treatment. Photosynthesis studies were run 1 day to 6 wk after treatment. Photosynthetic activity decreased rapidly. Net photosynthesis was strongly inhibited during wk 1 but was increasing by wk 5. Ultrastructural changes observed included granular body formation; deterioration of oil bodies, endoplasmic reticulum, and ribosomes; and vacuolation of cytoplasm. The mode of action of glyphosate is complex, causing changes in both catabolic and anabolic reactions in the cells.

81-3308. Zitter, T. A.; Simons, J. N. (Dep. Plant Pathol., Cornell Univ., Ithaca, NY 14853) **Management of viruses by alteration of vector efficiency and by cultural practices.** *Annu. Rev. Phytopathol.* 18: 289-311; 1980 (176 references).

The management of plant virus diseases is reviewed. Two major areas of control techniques are considered: interference with vectors, and cultural practices. A major method of vector interference is the control of insect populations with insecticides. Although this method plays a role in reducing the spread of viral disease, its effectiveness depends on the particular virus-vector relationship involved. Several cases are described in which insecticide control of insects was successful as a vector interference technique. However, insecticides have generally failed to control viral diseases because the viruses can be vectored in such a short time that the toxic effects of the chemicals are nullified. The use of integrated controls is also discussed.

81-3309. Papavizas, G. C.; Lumsden, R. D. (Soilborne Dis. Lab., Plant Prot. Inst., Agric. Res., SEA, USDA, Beltsville, MD 20705) **Biological control of soilborne fungal propagules.** *Annu. Rev. Phytopathol.* 18: 389-414; 1980 (154 references).

Biological control related to the fate of fungal propagules in soil or rhizospheres is reviewed, with emphasis on the effects of microbial interactions in soil. Propagule numbers can be controlled at various stages. In the dormant state, mycoparasitism has been somewhat successful. *Spordesmium sclerotivorum* has been shown to be destructive to *Sclerotinia* spp. and related fungi. During germination, propagule reduction can be achieved by germination-lysis or by control of fungistasis. After germination, germling function may be interrupted by lysis and mycoparasitism of mycelia, or germling growth and sporulation may be suppressed. Methods of inactivation of propagules include antibiosis in the soil (mediated by specific toxic metabolites of microbial origin, by soil fungitoxins, and by lytic agents) and enhancement of the fungistatic properties of the soil. Other general control methods include the decrease in monoculture and the existence of suppressive soils. It is concluded that there are shortcomings in the research in this area of biological control, and reasons for this conclusion are discussed.

81-3310. Mankau, R. (Dep. Nematol., Univ. California, Riverside, CA 92521) **Biological control of nematode pests by natural enemies.** *Annu. Rev. Phytopathol.* 18: 415-440; 1980 (76 references).

The use of natural enemies for control of nematode pests is reviewed. The most important and promising natural enemies are discussed, recent studies are analyzed, and topics for future research are suggested. Procaryotic parasites of nematodes include viruses, rickettsias, and bacteria; the latter are the most widely studied. One type of bacteria that shows promise as a biological control agent is *Bacillus penetrans*, whose life cycle is remarkably adapted to parasitism. Fungi that parasitize the nematodes themselves or their eggs have been studied extensively. One example is the development of a commercially prepared isolate of *A hrobotyrus* to protect commercial mushrooms from the destructive mycophagus nematode *Ditylenchus*

myceliophagus. Predaceous nematodes have also been studied, especially the Mononchida. A basic group of Mononchid species appears in most soils, and research is necessary to determine the role these nematodes play in the population dynamics of pest nematodes. Another promising area of research is predaceous soil mites. It is concluded that little is known about the biological antagonists of nematodes, but their use in biological control has potential.

81-3311. Loehr, R. C., ed.; Haith, D. A., ed.; Walter, M. F., ed.; Martin, C. S., ed. (Coll. Agric. & Life Sci., Cornell Univ., Ithaca, NY) **Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.** (Ann Arbor Sci. Publ. Inc.: Ann Arbor) 740 pp.; 1979.

The proceedings of the 1978 Cornell Agricultural Waste Management Conference are presented. The book is based on the concept that environmental, agricultural, and silvicultural management objectives are consistent and, along with water quality goals, may be met in a manner which is practical for the farmer and forest owner. Papers are presented that deal with governmental aspects; approaches for best management practices selection; nutrient management; silviculture; economic, policy, and institutional aspects; state and watershed approaches; and modeling studies. Remarks from representatives of academic institutions and the US EPA introduce the proceedings. Abstracts of chapters from this book will appear in the appropriate sections of this issue of *Pesticide Abstracts*.

81-3312. Bailey, G. W.; Waddell, T. E. (Environ. Res. Lab., US EPA, Athens, GA) **Best management practices for agriculture and silviculture: an integrated overview.** In: *Best Management Practices for Agriculture and silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D.A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH05: 33-56; 1979 (17 references).

An overview is presented of approaches for the identification, selection, and implementation of best management practices (BMP) for controlling nonpoint source (NPS) pollution of the environment from agricultural and silvicultural practices. Pesticide cycling in the environment is discussed as an example of NPS pollution. BMP for pesticides, heavy metals, plant nutrients, and other soil contaminants call for the minimization of soil solution concentrations of these substances to reduce runoff and lessen the possibilities of stream pollution. Some other subjects discussed include new institutional arrangements in the agro-forestry sectors; erosion control; public expectations; specificity of NPS control programs, long-term environmental implications; and the ultimate fate of chemicals in the environment. The cost/benefit of NPS control, food production goals, cost-sharing in BMP, land use regulation, and mathematical, model, and environmental assessment techniques are also discussed.

81-3313. Unger, S. G. (Dev. Plann. & Res. Assoc. Inc., Manhattan, KS) **Environmental implications of trends in agriculture and silviculture.** In: *Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH10: 117-131; 1979.

The trends in agriculture and silviculture that will have the most important long-term effects were reviewed by an evaluation workshop panel. Thirty-nine specific trends were assessed within the silviculture sector, the subjects of access to timber and site preparation practices received the highest priority rankings on the list. Pest control practices ranked 8th and encompassed the selected use of chemical pesticides, increased uses for biological control agents (pheromones, repellents, attractants), and mechanical methods to eliminate infested materials. About 200 specific trends were evaluated within the agricultural sector, which was divided into 4 subsectors. In the nonirrigated crop production subsector, integrated pest management (IPM) practices ranked 4th; IPM encompassed improved scouting and the use of appropriate pest control measures (chemical, biological, or mechanical) to control existing or predictable pest problems. In the same category, the use of new pesticides, such as systemics, microencapsulated pesticides, surfactants, biodegradable agents, and alternative formulations ranked 5th. In addition, 4 of the principal environmental concerns expressed by workshop members were discussed, and 3 research and public policy issues were summarized.

81-3314. Currier, J. B.; Siverts, L. E.; Maloney, R. C. (Watershed Systems Dev. Group, Forest Serv., USDA, Ft. Collins, CO) **An approach to water resources evaluation of nonpoint sources from silvicultural activities—a procedural handbook.** In: *Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH19: 271-280; 1979 (1 reference).

A systematic, and analytical procedure for identifying and assessing alternative technical solutions to existing or potential nonpoint source pollution problems associated with site-specific silvicultural activities is presented. To apply the procedure, a system of quantifiable numerical expressions must be used for the existing water quality problems and water quality objectives. Procedures for each of the sections (hydrology, surface erosion, soil mass movement, total potential sediment, temperature, dissolved oxygen and organic matter,

nutrients, and introduced chemicals) are outlined. Fertilizers, insecticides, fungicides, and herbicides are commonly introduced into a watershed as part of silvicultural management. The impact of pesticides on water quality depends on toxicity to man and aquatic organisms, mobility, persistence, accuracy of placement, and orientation to streams. The analysis presented is compatible with other resource evaluations and when used in the planning of silviculture activity, should aid in maintaining or enhancing stream quality.

81-3315. McGrann, J. M.; Meyer, J. (Dep. Econ., Iowa State Univ., Ames, IA) **Farm-level economic evaluation of erosion control and reduced chemical use in Iowa.** In: *Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH26: 359-372; 1979 (11 references).

The farm-level economic impact of soil loss control and reduced chemical use was examined in farms typical of 3 major soil associations in Iowa, which cover a wide range of farming conditions. The effect on farm income of reducing fertilizer and banning pesticide use to reduce nonpoint pollution was studied. In continuous corn programs, eliminating insecticide use would reduce income by ~ $7/acre, while eliminating herbicide use would reduce income by ~ $13/acre. For corn-soybean rotations, eliminating herbicide use would reduce income by about 35%. Information gained from crop rotation and soil management studies is necessary to educate farmers and the public to implement nonpoint water pollution control programs sensitive to local agricultural runoff needs.

81-3316. Vanderholm, D. H.; Frank, J. F.; Taylor, A. G. (Agric. Eng. Dep., Univ. Illinois, Urbana-Champaign, IL) **Development of a 208 plan for agricultural nonpoint pollution sources in Illinois.** In: *Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH38: 563-580; 1979.

Subcommittees of the Agricultural Task Force set up by the Illinois Environmental Protection Agency have extensively reviewed the problems of water quality of agricultural watersheds. Their recommendations and guidelines are summarized and the major conclusions drawn from their investigations reported. Existing agencies and organizations should be charged with the responsibility of implementing regulatory programs for water pollutants. Pesticides can affect water quality by their presence in the aquatic food chain, by disposal of pesticide containers, and by disposal of dilute rinsates from sprayers. Most pesticides of low water solubility have been banned from use. Wind and water erosion cause significant nonpoint contamination of waterways with pesticides. Integrated pest management systems and new methods of crop production are being studied to reduce the need for harmful pesticides in agriculture. Costs for implementing recommended programs for reducing agricultural water pollutants will be high and should be shared by the public.

81-3317. Yom-Tov, Y. (Dep. Zool., Tel-Aviv Univ., Israel) **The timing of pest control operations in relation to secondary poisoning prevention.** *Biol. Conserv.* 18(2): 143-147; 1980 (6 references).

Prodex application to fields in Israel for chuckar partridge eradication was timed to be of minimal danger to raptors. The nesting and migration cycle of the raptors was studied, and a period considered safe for pesticide application was identified; the period was concurrent with the wheat planting season, and occurred between the autumn and spring migrations of raptors. This period was chosen for testing. Sorghum seeds mixed with Prodex (30 g Prodex + 90 ml water/kg grain) were used to poison the partridges. During the poisoning operation, there were no incidents of secondary poisoning of raptors; this was attributed to the timing of the poisoning when most raptors had left the area, and to the fact that the investigators collected the carcasses of the dead partridges twice daily. After poisoning, which proved effective in eradication, wheat crops were planted in the fields. In years prior to this partridge program, as many as 1000 partridges/km² were observed in the fields eating seeds and seedlings. After poisoning, only 200 birds were seen in the fields, and no damage was detected. In addition, the non-target raptors were not harmed.

81-3318. Vernberg, F. J., ed.; Calabrese, A., ed.; Thurberg, F. F., ed.; Vernberg, W. B., ed. (Belle W. Baruch Coastal Res. Inst., Univ. South Carolina, Columbia, SC) **Biological Monitoring of Marine Pollutants.** (Academic Press: New York): 559 pp.; 1981.

Papers, presented at a symposium entitled *Pollution and Physiology of Marine Organisms* held at the National Marine Fisheries Service, Milford Laboratory in Milford CT (November 7-9, 1979) are published. Emphasis is placed on the application of laboratory techniques to field-oriented biological monitoring programs. The symposium is divided into sections, including synthetic organics, heavy metals, petroleum hydrocarbons, and physiological monitoring. Topics considered include the effects of first- and second-generation pesticides on an estuarine mysid, effects of chlorophenols on grass shrimp, and stress response of mullet and polychaete worms to pentachlorophenol.

81-3319. South, D. B.; Sung, S. J. S. (Dep. For., Agric. Exp. Stn., Auburn Univ., Auburn, AL) **A new method for**

screening herbicides for use in pine nurseries. *Can. J. For. Res.* 10(2): 164-169; 1980 (13 references).

A simple bioassay for determining photosynthesis inhibition using discs cut from the cotyledons of pumpkin was adapted to the study of herbicidal action on pine cotyledons. The method is based on variations in buoyancy of the discs; the presence of herbicides that decrease O_2 evolution reduces buoyancy, causing the discs to sink. In the first experiment, 5-mm segments of the cotyledons from loblolly pine seeds were cut and transferred to distilled water. Fifty segments were placed in a $1 \times 10^{-3} M$ solution of trifluralin, napropamide, oxyfluorfen, bifenox, prometryne, atrazine, or hexazinone. In the second experiment, a comparison was made of the response of different pine species to hexazinone. Seeds of loblolly pine, longleaf pine, shortleaf pine, and eastern white pine were grown in germination packets in a growth chamber. In the first experiment, during light conditions, all 3 triazines induced sinking of the cotyledons. Hexazinone and atrazine were the most toxic and increased sinking in 4 hr. Prometryne did not increase sinking before 8 hr. Germination was not decreased by bifenox at 6.7 kg/ha or by oxyfluorfen at 1.1 kg/ha. Survival of 4-wk-old seedlings was not decreased with bifenox at 4.5 kg/ha or oxyfluorfen at 1.1 kg/ha. Diphenyl ester herbicides apparently affect photosynthesis of loblolly pine much less than do the triazine herbicides. Trifluralin did not significantly affect the rate of sinking cotyledons in the light. Napropamide caused some sinking of cotyledon segments in the light, but the difference was not significant. The second experiment showed that shortleaf varieties were more sensitive to perfluidone, butralin, and trifluralin than loblolly. Longleaf was more tolerant of hexazinone. Shortleaf and eastern white pine were the least tolerant.

81-3320. Benezet, H. J.; Knowles, C. O. (Dep. Entomol., Univ. Missouri, Columbia, MO 65211) **Degradation of chlordimeform by algae.** *Chemosphere* 10(8): 909-917; 1981 (12 references).

A study was carried out on the degradation of the acaricide/insecticide chlordimeform by 2 algal types, *Chlorella* and *Oscillatoria.* Algae were grown for 2-5 days prior to amending with ethanolic solutions of ^{14}C-labeled chlordimeform. Effluent air was passed through a sodium hydroxide trap during the 14-day incubation; radiocarbon in the trap was then determined by radioassay. After incubation, cultures were filtered to yield cell residue and filtrate, which were radioassayed. In cultures containing heat-killed algae, there were low levels of chlordimeform (10%), and high levels of the metabolite toluidide, indicating appreciable nonenzymatic degradation of chlordimeform. The majority of the radiocarbon partitioned into ethyl acetate. In cultures of live algae, the aqueous fraction contained the majority of the radiocarbon, and the major metabolites identified included the toluidide, toluidine, and 2 anthranilic acids. The formation of high levels of radioactive carbon dioxide in live but not in heat-killed, algae cultures was also observed. It was concluded that chlordimeform in algae cultures was hydrolyzed to the toluidide, in a reaction that was mainly nonenzymatic, although some enzymatic catalysis cannot be excluded.

81-3321. Khotyleva, L. V.; Deeva, V. P.; Levchik, E. I. (Inst. Genet. & Cytol., Acad. Sci., Belorussian SSR, USSR) **Rol' otdel'nykh khromosom v izmenenii soderzhaniya nukleniovykh kislot u rastenii pshenitsy, obrabotannykh 2,4-D. [Role of individual chromosomes in the change in nucleic acid content in wheat plants treated with 2,4-D.]** *Dokl. Akad. Nauk BSSR* 25(7): 664-666; 1981 (11 references) (Russian).

The nature of the change in nucleic acid content, activity of the corresponding nucleases and protein content were studied in Chinese spring wheat plants under the effect of 2,4-D. Changes were related to the state of individual chromosomes. Three resistant and 3 sensitive lines were compared to the resistant euploid form. The coincidence of the character of the changes in DNA content and DNase activity in the resistant euploid and resistant lines 2A and 1D suggested that the biochemical processes responsible for resistance to 2,4-D are similar and are manifested at the early stages of action. Further manifestation of the effect of 2,4-D on the nucleic acid metabolism level and its phenotypic expression in the lines studied is the result of chromosome differences.

81-3322. Halbert, M. K.; Mazumder, M. K.; Bond, R. L. (Dep. Anesthesiol., Sch. Med., Univ. Louisville, Louisville, KY 40292) **Respirable particulates in household aerosols.** *Environ. Res.* 26(1): 105-109; 1981 (10 references).

Assessment of the potential inhalation hazard from longterm normal use of household aerosols requires a knowledge of particulate size and probable deposition of the particulates in the respiratory tract. The methods of optical microscopy, cascade impaction, and single-particle aerodynamic relaxation-time (SPART) analysis were used to determine the size spectra of 5 common household aerosol products (air freshener, insecticide, spray lubricant, oven cleaner, and furniture polish). Count median diameters obtained in the microscope study agreed well with the values obtained in the SPART analysis, with values ranging from 0.74 to 1.22 μm in both studies. Comparison of mass median diameters obtained in the SPART analysis and cascade impaction study showed less agreement. Values for both techniques ranged from 1.95 to 3.80 μm with the exception of the oven cleaner, which yielded a mass median aerodynamic diameter of 23.5 μm in the impaction study. (Author abstract by permission of Academic Press, modified)

81-3323. Savitsky, A. C.; Wiers, B. H.; Wendt, R. H. (Procter & Gamble Co., Packag. Soap & Deterg. Div., Cin-

cinnati, OH 45217) Adsorption of organic compounds from dilute aqueous solutions onto the external surface of type A zeolite. *Environ. Sci. Technol.* 15(10): 1191-1196; 1981 (34 references).

Type A zeolite, an insoluble crystalline sodium aluminosilicate, has been developed as a water-hardness controlling agent for laundry detergent products. In order to assess the environmental safety of this material, we have examined the adsorption of organic compounds of varying polarity onto the external surfaces of calcium-exchanged type A zeolite in aqueous medium at pH 8. The compounds included *p*-chlorophenol, dieldrin, dodecylhexakis(oxyethylene) alcohol ($C_{12}E_6$), and tetradecyltrimethylammonium chloride. In addition, adsorption onto the sodium form of the zeolite was studied with methylene blue (to characterize the zeolite) and with linear alkylbenzenesulfonate (LAS). Type A zeolite provides a relatively weak adsorptive surface for organics of all polarities studied when compared to adsorption of these compounds onto natural clay minerals and sewage sludge. The introduction of type A zeolite into environmental waters through its use in laundry detergents should therefore not alter the normal fate of organic molecules in the environment.

81-3324. Giere, J. P.; Johnson, K. M.; Perkins, J. H. (Author address not given) A closer look at no-till farming. *Environment* 22(6): 14-20, 37-41; 1980 (64 references).

A discussion is presented of no-till farming (also known as conservation tillage or minimum tillage) as a possible solution to weed problems that combines low labor requirements with low erosion rates. It is pointed out that the extensive use of plowing, which is viewed as a labor-saving invention for killing weeds, has led to serious erosion problems in some areas. The technique considered involves the reduced use of plowing and increased reliance on herbicides. However, the hazards associated with the increased use of herbicides must be studied, and such study may ultimately lead to the conclusion that the dangers are too great to be tolerated. The origins and current status of no-till farming are described, as are projections for future use. The complex of risks and benefits associated with no-till agriculture are considered. Environmental and economic concerns are critical. The toxic and genetic dangers of some of the herbicides used, particularly paraquat, must be considered. Herbicides can eliminate natural hosts of certain insects, forcing them on to the cultivated crop. As a result, the simultaneous attack of a crop by several pests is more common than in conventional tillage systems. Recommendations are made.

81-3325. Sosnovaya, O. N. (Inst. Plant Physiol., Acad. Sci., Kiev, USSR) K voprosu detoksikatsii prometina rasteniyami kartofelya i kukuruzy. [Problem of prometryne detoxification by potato and maize plants.] *Fiziol. Biokhim. Kul't. Rast.* 12(4): 367-370; 1980 (3 references) (Russian).

Potato aquatic cultures were used to study the dependence of prometryne detoxication intensity on the nutrition level and the presence of the inhibitor, dithiothreitol. Nutrition conditions were seen to affect the subsequent uptake and detoxication of the herbicide in these cultures. Retardant application inhibited its inactivation. The processes of prometryne uptake in maize roots and detoxication were found to depend on the nutrition conditions, the application of atrazine, and the presence of the inhibitor. Transferase enzymes may participate in prometryne detoxication.

81-3326. Khan, S. U. (Chem. & Biol. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario Canada) Pesticides in the Soil Environment. *Fundamental Aspects of Pollution Control and Environmental Sciences* (Elsevier Sci. Publ. Co.: Amsterdam): 5: 235 pp.; 1980.

Available data on the behavior and fate of pesticides in soils is presented. The classification of pesticides is considered. Physicochemical processes affecting the behavior and fate of pesticides in soil are discussed, including movement, volatilization, photodecomposition, chemical conversion and degradation. Numerous interactions between pesticides and soil components are considered. Biochemical reactions associated with pesticide metabolism by microorganisms are examined. The persistence of residues in soils, uptake of residues from soils, the nature of soil-bound residues, and minimization of residues in soil are discussed. Analytical techniques for determining residues in soil are also reviewed.

81-3327. Cummins, D. G.; Hardcastle, W. S. (Agric. Exp. Stn., Georgia Station, GA) Effects of preemergence and postemergence herbicides on pearl millet. *Ga. Agric. Exp. Stn. Res. Rep.* 354: 3-10; 1980.

Five pearl millet hybrids were treated with pre- and postemergence herbicides. Preemergence treatments included propazine at 1, 2, and 3 lb AI/acre (1.12, 2.24, and 3.36 kg/ha); a mixture of 2 parts napthalam + 1 part dinoseb at 4.5 lb AI/acre (5.04 kg/ha); and propachlor at 5.0 lb AI/acre (2.24 kg/ha), dinoseb at 3 and 5 lb AI/acre (3.36 and 5.6 kg/ha), and paraquat at 0.5 and 0.75 lb/acre (0.56 and 0.84 kg/ha). Preemergence herbicides were applied broadcast in water at a volume of 20 gal/acre (187 l/ha). Postemergence herbicides were broadcast in water at 40 gal/acre (374 l/ha). Phosphorus and potassium fertilization was made according to the results of soil testing. Propazine application at 1 lb AI/acre was tolerated for preemergence treatment in pearl millet production. Yields were equal to or greater than cultivated check plots. Rates of 2 or 3 lb AI/acre (2.24 or 3.36 kg/ha) reduced the yield. Weed control at the 1 lb/acre (1.12 kg/ha) rate may be limited. Yields were markedly reduced with naphthalam +

dinoseb and with propachlor treatments in 1 or more years; these treatments are not suggested for use with pearl millet. In postemergence weed control testing, glyphosate greatly reduced yields compared to other treatments. Paraquat reduced yields compared to the cultivated control plot, but these differences were significant only at the 0.5 lb/acre (0.56 kg/ha) rate in 1976 and the 2-yr mean. Yields following application of dinoseb at 3 and 5 lb AI/acre (3.36 and 5.6 kg/ha) did not differ from the cultivated check.

81-3328. Sacalis, J. N.; Nichols, R. (Dep. Hortic. & Forest., Cook Coll., Rutgers Univ., New Brunswick, NJ 08903) **Effects of 2,4-D uptake on petal senescence in cut carnation flowers.** *HortScience* 15(4): 499-500; 1980 (10 references).

Freshly harvested cut carnation flowers were placed singly in vials containing water or various concentrations of 2,4-D, to determine the effects of 2,4-D on petal senescence. Each day flowers were evaluated visually for signs of deterioration (petal curling and browning). In addition, ethylene determinations were made by placing flowers in sealed glass chambers, and analyzing gas samples by gas chromatography. At 4, 20, and 100 mg/l, 2,4-D enhanced petal senescence and ethylene evolution; at 500 mg/l, 2,4-D retarded petal senescence and inhibited ethylene evolution. All carnation tissues except petals were damaged by uptake of 500 mg/l 2,4-D. It is hypothesized that if the pistil initiates petal wilting, the selective destruction of the pistil by 2,4-D prevents early petal senescence.

81-3329. Suzuki, T.; Holden, I.; Casida, J. E. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Diphenyl ether herbicides remarkably elevate the content in *Spinacia oleracea* of (-2E-1)-3-(4 hydroxy-3-methoxyphenyl) -*N*-(2-(4ydroxy- 3-methoxyphenyl) ethyl)-2- propenamide.** *J. Agric. Food Chem.* 29(5): 992-995; 1981 (10 references).

Spinach (*Spinacia oleracea*) leaves treated with the diphenyl ether bifenox and held in the light for 48-72 hr contain up to 23 ppm of a new phenolic amide identified by ^{1}H and ^{13}C NMR, MS, and synthesis as (*E*)-3-(4-hydroxy-3-methoxyphenyl) -*N*-[2-(4-hydroxy- 3- methoxyphenyl) ethyl]-2-propenamide. The level of this amide is elevated by 5- to >50-fold in the light compared to in the dark following treatment of spinach leaves with any one of 6 ortho-substituted diphenyl ether herbicides and 2 *N*-aryl-3,4,5,6-tetrahydrophthalimides considered to have the same mechanism of herbicidal action. Two meta-substituted diphenyl ether herbicides and 13 herbicides of other types are less effective or ineffective in elevating the level of this amide in a light-dependent manner. The compound discovered in spinach was not detected in 20 other crops and weeds even when treated with the diphenyl ether acifluorfen and held in the light. (Author abstract reprinted by permission of the American Chemical Society)

81-3330. Lamoureux, G. L.; Gouot, J. M.; Davis, D. G.; Rusness, D. G. (Metab. & Radiat. Res. Lab., SEA, USDA, Fargo, ND 58105) **Pentachloronitrobenzene metabolism in peanut. 3. Metabolism in peanut cell suspension cultures.** *J. Agric. Food Chem.* 29(5): 996-1002; 1981 (6 references).

The metabolism of pentachloronitrobenzene-*UL*-^{14}C (PCNB; quintozene) was studied in peanut (*Arachis hypogaea* L.) cell suspension cultures over a 14-day period. The primary metabolic pathways involved an initial conjugation with glutathione. Seven major metabolites were detected by high-performance liquid chromatography, and 5 of these were identified by mass spectrometry of suitable derivatives: S-(pentachlorophenyl) glutathione, *S*-(*ar*-tetrachloronitrophenyl) glutathione, *S,S'*-(*ar*-tetrachlorophenylene) dicysteine, *S*-(*ar*-tetrachloronitrophenyl)-*N*-malonylcysteine, and *S*-pentachlorophenyl)-*N*-malonylcysteine. Several precursor-product relationships were demonstrated. Nonextractable residue, *S*-(pentachlorophenyl)-*N*-malonylcysteine, *S*-(*ar*-tetrachloronitrophenyl)-*N*-malonylcysteine, and metabolite III appeared to be terminal metabolic products. PCNB metabolism in peanut cell suspension cultures was compared to PCNB metabolism in the roots of intact peanut plants. The primary differences between the 2 systems appeared to be quantitative. Pentachloroaniline and nonextractable residue were produced in larger amounts in intact peanut plants than in the cell suspension cultures. Several advantages and disadvantages of conducting metabolism studies in cell suspension cultures were discussed. (Author abstract reprinted by permission of the American Chemical Society)

81-3331. Suzuki, T.; Casida, J. E. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Metabolites of diuron, linuron, and methazole formed by liver microsomal enzymes and spinach plants.** *J. Agric. Food Chem.* 29(5): 1027-1033; 1981 (19 references).

Mouse liver microsomal oxidases convert diuron to 7 metabolites modified only at the dimethylamino moiety and to an *N*-hydroxy derivative. Linuron in this system yields the corresponding -$N(OCH_3)CH_2OH$, -$NHCH_3$, and -$NHOCH_3$ derivatives. Microsomal metabolism of methazole requires NADPH and gives primarily desmethylmethazole under aerobic conditions and Ar-$NHC(O)NHCH_3$ under nitrogen. Most of these metabolites are also detected in spinach leaves treated with [^{14}C]diuron and [^{14}C]methazole. Some 3-hydroxy-1-methylurea from methazole metabolism in spinach is reduced to the 1-methylurea while the remainder is conjugated as the N-O-β-D-glucoside and its 6-*O*-malonyl ester (identified by ^{1}H and ^{13}C NMR). Synthesis procedures, spectroscopic data, and potencies as Hill reaction inhibitors are given for many of the metabolites and derivatives which are useful in their identification. Methazole appears to be a proherbicide

while diuron and linuron act directly and via metabolites as photosynthetic inhibitors. (Author abstract reprinted by permission of the American Chemical Society, abridged)

81-3332. Crissman, J. W. (Ithaca, NY 14853) **Lindane intoxication in man.** *J. Am. Vet. Med. Assoc.* 177(4): 312-314; 1980 (1 reference).

A young farmer used lindane, prescribed by a veterinarian to control sarcoptic mange in pigs. Neither the veterinarian, nor the label on the bottle, indicated any possible danger of skin contact. The farmer died 5 mo later from aplastic anemia. In this letter to the editor, the victim's brother (a veterinarian) notes that 14 cases of aplastic anemia or hematologic malignancy following lindane exposure are reported in the literature. This effect is thought to be caused by unusual hypersensitivity or genetic predisposition. Studies of individuals chronically exposed to lindane have noted significant deviation of several hematologic parameters, but these variations were still within normal limits. The need to publicize the risks of lindane exposure is stressed.

81-3333. Perkins, M. A.; Boston, H. L.; Curren, E. F. (Dep. Civil Eng., Univ. Washington, Seattle, WA 98195) **The use of fiberglass screens for control of Eurasian watermilfoil.** *J. Aquat. Plant Manage.* 18: 13-19; 1980 (13 references).

Aquascreen, vinyl coated fiberglass mesh, was tested as a control for Eurasian watermilfoil (*Myriophyllum spicatum* L.) in Union Bay at the outlet of Lake Washington. Union Bay is ~ 140 ha, with depths averaging 2-3 m. Nuisance growth of Eurasian watermilfoil was first noted in 1973 in the area. About 80-90% of the bay's area is currently infested with the plants to different degrees of severity. Two test plots at different water depths were studied. Panels of the screening were removed at 1, 2, and 3 mo intervals; 1 panel was left in each plot for over-the-winter coverage. Plant biomass increased rapidly in August, reached peak standing crops in October, and rapidly declined through November. Biomass in the shallow water area was about twice that within the deep water until the November sample. One month of coverage resulted in average decreases in plant biomass of 25% and 35% for the shallow and deep water plots, respectively. Extensive milfoil stem elongation was noted. Removal of 3-mo screens revealed healthy plant materials but at a much reduced level. Optimum coverage time was 2 mo, which resulted in a 75% reduction in plant biomass with only limited regrowth after panel removal. In most cases no significant difference in water quality that might have been attributable to the use of the screens was detected.

81-3334. Yearian, W. C.; Luttrell, R. G.; Stacy, A. L.; Young, S. Y. (Virol. & Bio-Control Lab., Dep. Entomol., Univ. Arkansas, Fayetteville, AR) **Efficacy of *Bacillus thuringiensis* and *Baculovirus heliothis*-chlordimeform spray mixtures against *Heliothis* spp. on cotton.** *J. Ga. Entomol. Soc.* 15(3): 260-271; 1980 (14 references).

Bacillus thuringiensis, Baculovirus heliothis, chlordimeform, and a standard insecticide were applied alone or in combination to cotton plots in southwestern Arkansas. Plots were ~ 0.04 ha. Each treatment was replicated 4 times in a randomized complete block design. Application volume was 46 l/ha in 1974 and 91 l/ha in 1975-76. Nine applications were made in 1974, with initial application on 18 July and subsequent applications at 5 day intervals. *Heliothis* population levels were sufficiently high in the test plots each year to significantly reduce yields unless control measures were taken. Based on mean weekly egg counts, initial infestation levels were relatively uniform for all treatments. The *B. thuringiensis* treatments along with the *B. heliothis* treatment failed to significantly reduce mean weekly *Heliothis* larval populations. Chlordimeform at both rates significantly increased yields over the untreated check plot. The combination of Dipel (*B. thuringiensis*) and chlordimeform (140 g/ha) did not increase yield above that achieved with chlordimeform alone, yet yields from all Thuricide HPC (*B. thuringiensis*)- chlordimeform treatments were significantly greater than yields with Thuricide HPC alone. The data indicate that little benefit was derived from the addition of *B. thuringiensis* to chlordimeform sprays for control of *Heliothis* in a season long program. Certain combination of chlordimeform- *B. heliothis* formulations provided *Heliothis* suppression superior to either applied singly.

81-3335. Berezovskii, M. Ya.; Khachatryan, A. R.; Papoyan, Z.; Tarkhanyan, K. (Arm. Agric. Inst., Erevan, USSR) **Effektivnost' metazina na posevakh gorokha. [Effectiveness of metazin on pea plantings.]** *Khim. Sel'sk. Khoz.* 19(7): 30-32; 1981 (3 references) (Russian).

Field experiments were conducted in 1975-1978 in the Armenian SSR, USSR on dark chestnut soil with 3.73% humus in the topsoil layer. Pea cultivar Uladovsk 209 had a barley predecessor. Soil was sprayed with an aqueous suspension of metazin the day after planting peas. Herbicides (metazin, prometryne) did not have a negative effect on peas. Chemical composition of peas (content of crude protein, cellulose, ash) was identical in all variants of the experiments, even when metazin and prometryne were used at increased doses. The stability of the chemical composition of the yield, independent of the herbicide even under conditions when prometryne had some degree of negative effect on plant growth and yield, was general in character and was not only specific to triazine compounds. Metazin residues in pea plants at a dose of 2 kg/ha were 0.46 mg/kg after 1 mo and 0.2 mg/kg of dry mass after 2 mo. Herbicide was not detected in ripe peas. The successive decrease in metazin residues in pea plants is linked to the intensity of herbicide inactivation in soil.

81-3336. Kondrat'eva, E. M.; Vasil'eva, V. N.; Sil'yanova, Y. I. (Karan Agric. Inst., Karan, USSR)

Osobennosti sozrevaniya yarovoi pshenitsy, obrabotannoi khlorkholinkhloridom. [Ripening characteristics of spring wheat treated with chlorocholine chloride.] *Khim. Sel'sk. Khoz.* 19(7): 34-37; 1981 (4 references) (Russian).

Experiments on soft wheat were performed in 1969-1975. Decreased gluten and protein contents in wheat grain treated with the herbicide TUR (cholorocholine chloride; chlormequat chloride) were noted. Because of the delay in accumulation in grain of all protein substances under the effect of TUR, it is recommended that crops treated with this weed retardant be harvested later than usual.

81-3337. Lebedeva, G. F.; Epishina, L. V.; Chernova, N. I. (Moscow State Univ., Moscow, USSR) **Persistentnost' prometrina i propazina v dernovo-podzolistoi pochve. [Persistence of prometryne and propazine in soddy-podzolic soil.]** *Khim. Sel'sk. Khoz.* 19(7): 47-50; 1981 (23 references) (Russian).

Field experiments were conducted in 1974-1977 on soddy-podzolic, slightly loamy, poorly cultivated soil. The following indices were used to establish the duration of the toxic effect of herbicides: changes in the weediness of the experimental plots; a decrease in the mass of test-plants, periodically sown; inhibition of chlorophyll formation in *Chlorella*. Prometryne content in soil was determined spectrophotometrically, and propazine, chromatographically. Most triazines were inactivated during the first mo after application (80-90%). Residue levels detected in soil were directly proportional to dose.

81-3338. Olsson, H.; Brandt, L. (Dep. Oncol., Univ. Hosp., S-22185 Lund, Sweden) **Non-Hodgkin's lymphoma of the skin and occupational exposure to herbicides.** *Lancet* 2(8246): 579; 1981.

In this letter to the editor the relationship between non-Hodgkins lymphoma and occupational exposure to herbicides is considered. Of 123 men with recent diagnoses of non-Hodgkin's lymphoma (NHL), 5 had cutaneous lesions as the sole clinically detectable manifestation. Four of these 5 patients had repeatedly, during the previous 18-20 yr, sprayed large areas with herbicides containing phenoxy acids. A 40-yr-old lumberjack had NHL in the right parotid region, and a history of exposure to 2,4,5-T and 2,4-D. A 45-yr-old gardener and farmer had NHL in the right frontal region and a history of exposure to MCPA and various other insecticides. A 57-yr-old lumberjack had NHL of the anterior chest wall, and a history of exposure to 2,4,5-T and 2,4-D. A 64-yr-old farmer had NHL of the left shoulder, and a history of exposure to MCPA and 2,4-D. Phenoxy acids are chemically related to chlorophenols; these findings suggest a relationship between cutaneous presentation of NHL and occupational exposure to this type of chemical. Phenoxy acids may be contaminated by dioxins.

81-3339. Anonymous **Seveso after five years.** *Lancet* 2(8249): 731-732; 1981 (15 references).

The results of a 5-yr survey of the effects of the accidental release of TCDD from a factory in Seveso, Italy are presented. With the exception of chloracne, there has been no evidence of poisoning related to TCDD. Chloracne was mild in about 30,000 nursery and secondary school age children with no signs of systemic toxicity. The rates of spontaneous abortions, teratogenic effects, and common infectious diseases were not different from control areas. However, increased numbers of nervous disorders have occurred. The incidence of cancer in Seveso has not yet been investigated in relation to the accident there because of the long latency period of the disease.

81-3340. Cloutiermantha, L.; Harrison, P. J. (Dep. Oceangr., Univ. British Columbia, Vancouver, British Columbia V6T 1W5, Canada) **Effects of sublethal concentrations of mercuric chloride on ammonium-limited *Skeletonema costatum*.** *Mar. Biol.* 56(3): 219-233; 1980 (42 references).

Tests were designed in which phytoplankton (the diatom *Skeletonema costatum*) were exposed to a double stress: a natural stress (limited ammonium) and a secondary stress (mercury pollution). *S. costatum* was grown under NH_4 limitation in a chemostat; $HgCl_2$ was added continuously at a rate of 0.37 and 3.68 n*M* $HgCl_2$ for a period of 4 wk. Growth was monitored by following changes in *in vivo* fluorescence using a fluorometer. Growth in Hg-treated chemostats declined drastically after 4 days, but recovered after 16 days. Possible mechanisms for this recovery are discussed. There was a significant decrease in the ability of these NH_4-limited cultures to take up ammonia at low concentrations. Short-term experiments (Hg exposure of 0.04 to 5.52 n*M* $HgCl_2$ for up to 5 hr) indicated the threshold of Hg toxicity to occur between 1.8 and 3.7 n*M*. The Hg toxicity threshold decreased by an order of magnitude to 0.2 n*M* when the NH_4-limited culture was starved of ammonia for 30 hr. The possible detrimental effects of Hg pollution during periods of seasonal nutrient limitation are discussed.

81-3341. Burdsall, H. H., Jr.; Hoch, H. C.; Boosalis, M. G.; Setliff, E. C. (Cent. For. Mycol. Res., For. Prod. Lab., For. Serv., USDA, Madison, WI 53705) ***Laetisaria arvalis* (Aphyllophorales, Corticiaceae): a possible biological control agent for *Rhizoctonia solani* and *Pythium* species.** *Mycologia* 72(4): 728-736; 1980 (9 references).

The possible role of a soil-inhabiting basidiomycete, *Laetisaria arvalis*, as a biological control agent against sugar beet root rot is discussed. The basidiocarps and cultures are described and illustrated. The generic placement of *L. arvalis* is also discussed, and its similarity to the genus *Phanerochaete* is considered.

81-3342. Chapin, G.; Wasserstrom, R. (Div. Sociomed. Sci., Sch. Public Health, Columbia Univ., New York, NY 10032) **Agricultural production and malaria resurgence in Central America and India.** *Nature (London)* 293(5829): 181-185; 1981 (105 references).

Increased malaria rates in India and Central America are discussed. The increases have paralleled intensified agriculture and increased use of pesticides in these countries. Complications of the early malaria control programs involving the use of DDT and dieldrin are considered. Increased pesticide use and the development of pesticide resistance in mosquito populations are discussed. It is suggested that overuse of pesticides on non-food crops such as tobacco and cotton, and cash crops such as rice, contributes to the development of resistance, while making no substantial contribution to the subsistance requirements of the rural poor. Integrated pest management (IPM) systems are discussed. The use of IPM on rice and cotton is recommended.

81-3343. Spiers, A. G. (Aokautere Sci. Cent. Min. Works & Dev., Palmerston North, New Zealand) **Biological control of *Agrobacterium* species *in vitro*.** *N. Z. J. Agric. Res.* 23(1): 133-138; 1980 (20 references).

In vitro studies were designed to elucidate factors involved in the biological control of crown gall disease caused by *Agrobacterium radiobacter var. tumefaciens.* Susceptibility of local isolates of *Agrobacterium* species to bacteriocin 84 produced by *A. radiobacter* var. *radiobacter* strain 84 on agar was determined. Effects of medium inoculation technique, post-inoculation temperature, incubation time, and incubation temperature on bacteriocin activity were studied. Bacteriocin production peaked simultaneously with peak bacterial growth, and declined as growth entered the lag phase. It was determined that 98% of pathogenic biotype 1 *Agrobacterium* were inhibited by bacteriocin 84. However, correlation was not complete, since 38% of biotype 1 non-pathogenic isolates were sensitive to bacteriocin 84. Of the 38 biotype 2 isolates tested, only 2 produced effective bacteriocins. These isolates now require field evaluation.

81-3344. Spiers, A. G. (Aokautere Sci. Cent., Min. Works & Dev., Palmerston North, New Zealand) **Biological control of *Agrobacterium* species on *Salix*.** *N. Z. J. Agric. Res.* 23(1): 139-142; 1980 (17 references).

Pot and field trials were carried out on cuttings of *Salix* to evaluate the biological control of crown gall disease caused by *Agrobacterium radiobacter* var. *tumifaciens.* The control method evaluated was the closely related strain, *Agrobacterium radiobacter* var. *radiobacter* strain 84. In pot trials, *Salix* cuttings were wounded with a scalpel and dipped into strain 84 suspension at levels of 0, 10^2, 10^3, 10^4, 10^5, 10^6, 10^7, and 10^8 cells/ml, then planted in soil inoculated with *A. radiobacter* var. *tumefaciens.* After an experimental period of 4-7 mo, plants were examined for stem and root galls. In the pot tests, disease was controlled completely with strain 84 at levels > 10^6 cells/ml. However, when field tests were carried out in a randomized 2-block design for 4 levels of strain 84 (10^5-10^8 cells/ml), control was not complete because of the presence of pathogens resistant to bacteriocin 84.

81-3345. Lien, B. C.; Walker, J. R. L.*; Peters, J. A. (Bot. Dep., Univ. Canterbury, Christchurch, New Zealand) **The effect of fluoroacetate (Compound 1080) and fluoride upon duckweeds.** *N. Z. J. Sci.* 23(2): 179-183; 1980 (7 references).

Cultures of *Lemma minor, Spirodela oligorrhiza,* and *S. polyrrhiza* were exposed to sodium fluoroacetate (Nafa) and sodium fluoride (NaF). *S. polyrrhiza* was the most sensitive to Nafa within the concentration range of 5-100 μM Nafa. Its growth was totally inhibited by 0.5 mM Nafa, whereas total inhibition of *S. oligorrhiza* and *L. minor* required 1 mM Nafa. Fluoride caused an early bleaching of the fronds, wheras Nafa caused chlorosis, followed by browning of *L. minor* and *S. polyrrhiza.* The possibility of interaction between Nafa and NaF was examined at different concentration of both agents. Increasing sub-lethal concentrations of Nafa significantly affected sensitivity to NaF. Increasing the sub-lethal concentrations of NaF did not affect sensitivity to Nafa. The toxicity of Nafa to duckweed may be due to its effect on duckweed's TCA cycle and related biochemical activities.

81-3346. Nagayama, J.; Kurayak, K. (Dep. Public Hyg., Kyushu Univ. Sch. Med., Kyushu, Japan) **[Effects of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin on benzopyrene metabolism in rat prostate glands.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 36(1): 441; 1981 (Japanese).

Effects of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD), a contaminant of the herbicide Agent Orange (2,4-D + 2,4,5-T), on benzopyrene metabolism in the prostatic tissue of male Sprague-Dawley rats were investigated. Rats were given 10 μg/kg body wt TCDD po; 3 days after administration of the TCDD the rats were sacrificed, and the prostates were removed. Control rats received corn oil instead of TCDD. An enzymatic mixture was made from the prostatic tissue and ^{14}C-labeled benzopyrene. After culturing, the quantity of the benzo(a)pyrene metabolites were assessed with high-pressure liquid chromatography. Comparison of benzo(a)pyrene metabolites in the control and TCDD-treated rat prostates showed that minute amounts of TCDD markedly induced the production of benzo(a)pyrene-metabolizing enzymes.

81-3347. Herdi, F. (Res. Inst. Plant Prot., Budapest, Hungary) **A napraforgo (*Helicanthus annuus* L.)**

lomblevelenek 2,4-D hatasara bekovetkezett szoveti elvaltozasa. [Tissue alteration caused by 2,4-D in the foliage-leaf of sunflower (*Helianthus annuus* L.)] *Novenytermeles* 29(3): 215-226; 1980 (12 references) (Hungarian).

The amine salt of 2,4-D (Dikonirt D) was applied at 145, 1450, and 7250 ppm concentrations by spray from airplane or helicopter. Effects were examined on the tissue of the sunflower foliage. Treatment was carried out on 12 June when the plants were ~ 12 cm high. Samples were taken from the plants on 14 June, 21 June, and 11 July. By 11 July, the leaf thickness had increased, particularly in response to 145 and 150 ppm concentrations. In response to the 7250 ppm concentration, leaf thickness decreased. The 145 and 1450 ppm concentrations encouraged leaf thickening. The 1720 ppm concentrations decreased leaf thickness; the length of the columnar parenchyma cells decreased considerably. A change in the external tangential wall thickening of epidermis cell was notable on both sides of the leaf. Distance between vascular bundles in the control plants decreased in the leaves of treated plants.

81-3348. Edwards, C. A. (Entomol. Dep., Rothamsted Exp. Stn., Harpenden, Herts AL5 25Q, England) **IOBC/WPRS integrated control of soil pests working group.** *Pedobiologia* 20(4): 292-298; 1980.

A report of the IOBC-WPRS working group for integrated control of soil pests is presented. The primary aim of this meeting was to discuss an integrated control program for sugar beet pests. Parasitic fungi that attack soil nematodes were reported. It was concluded that better techniques for evaluating the role of parasitism in nematode population control must be devised. A proposed collaborative program to be conducted on nematode control by several promising fungi was discussed. The role of organic matter on soil pests and diseases was considered. In general, additions of sewage sludge slurries increased the numbers of pests. Specific pests of sugar beet seedlings were discussed, and a variety of control methods outlined. Integrated biological and chemical control methods were presented.

81-3349. Wilkinson, R. E. (Dep. Agron., Univ. Georgia, Coll. Agric., Georgia Stn., Experiment, GA 30212) **Metolachlor influence on growth and terpenoid synthesis.** *Pestic. Biochem. Physiol.* 16(1): 63-71; 1981 (30 references).

Studies were conducted to determine the effects of metolachlor on growth and terpenoid synthesis in sorghum. Plants were grown in sand for the first experiment. Metolachlor was applied at rates of 0, 0.14, 0.28, 0.56, 1.12, or 2.24 kg/ha. Other plants were grown in nutrient solution containing 0, 0.0156, 0.0625, 0.25, 1, 4, 16, or 64 ppmw metolachlor. In a third test, gibberellic acid (GA_3) was added to the growth medium. The sand grown plants demonstrated reduced height and reduced fresh weight as a result of herbicide treatment. The herbicide inhibited shoot and root lengths in nutrient solution-grown plants. Tests showed that GA_3 reversed the effects of metolachlor. Tests on carrots showed that carotene synthesis was reduced 50% by 10^{-5} and 10^{-4} *M* metolachlor.

81-3350. Conway, G. R.; Comins, H. N. (Res. Sch. Biol. Sci., Natl. Univ., Canberra, ACT, Australia) **Resistance to pesticides: lessons in strategy.** *Pesticides* 15(4): 3-6; 1981 (6 references).

The value of models in providing strategic guidelines, particularly as to the relative contributions of different control techniques in an integrated control program, is discussed. Mathematical models can be built without detailed knowledge of all the biological and control parameters involved in a pest system. Ideally, mathematical models of resistance should predict the time when a particular pest population will develop resistance to a particular pesticide. However, as the genetic mechanisms in operation are not known, such an ideal situation does not exist. Thus, the objective of modelling is to derive relative time scales for different control options. The typical patterns of resistance-gene development occurs in 3 phases. In the first phase, the resistance gene is likely to be a liability, and will exist at a low equilibrium frequency determined by the opposing forces of mutation and adverse selection. In the second phase, the resistance gene spreads rapidly through the population, although it is still below the level at which control efficiency is noticeably reduced. The third phase occurs when control measures fail and resistance is detected; this phase is usually short, and corrective or delaying action is limited. An economic model aimed at reducing the long-term cost of depleting the susceptibility of pest populations is also discussed.

81-3351. Karanth, N. G. K.; Jayaram, M.; Majumder, S. K. (Discipline Infestation Control & Pestic., Cent. Food Technol. Res. Inst., Mysore, India) **Phytotoxicity of X-factor.** *Pesticides* 15(4): 7-10; 1981 (8 references).

X-factor and premium grade X-factor (a byproduct of lindane manufacture) were incorporated as drench at 0 and 10 ppm levels to mud pots, containing 7.5 kg of soil. Tap water was added to bring the moisture to about 60% water-holding capacity of the soil, and moisture was maintained at that level. French bean and tomato seeds were sown in these pots. Both test chemicals failed to significantly affect growth or nutrient uptake in the French bean plant. Residual analysis did not reveal any parent molecule in the plant body, possibly due to phytodegradation of the absorbed chemicals. Both chemicals inhibited root growth by ~ 35-42% and shoot growth by 22%. Except for stunted growth, plants in treated pots showed no symptoms of phytotoxicity. Weight reduction was high, amounting in 75% in both shoot and roots. Rate of

nutrient uptake increased by about 45% when X-factor was present and 35% with premium grade X-factor. Results suggest that tomato plants either have the ability to absorb more of the candidate chemicals or have poor detoxification mechanisms. In the uncropped soil about 20-25% of the original dose had disappeared in 3 wk. After the same time period 55-60% of the applied dose had disappeared in cropped soil. The findings suggest the possibility of using French bean, paddy, ragi, and brinjal as rotation crops in soils containing chlorinated pesticides.

81-3352. Balyan, R. S.; Singh, S. P.; Bhan, V. M. (Dep. Agron., Haryana Agric. Univ., Hissar, India) 2,4-D amine: toxicity and residual effect. *Pesticides* 15(4): 20-22; 1981 (3 references).

Four concentrations of 2,4-D (1.5, 3.0, 4.5, and 6.0 ppm) were tested in field crops on a complete randomized block design. The treatments were repeated 4 times on sandy loam planted with cotton, wheat, barley, oat, gram, peas, lentil, linseed, and sugar beets. At 1.5 ppm, the dimethylamine salt of 2,4-D did not injure the foliage or reduce grain and biological yields of any crop. At 3.0, 4.5, and 6.0 ppm 2,4-D amine produced no injury on growth or yield of wheat and barley; oats suffered slight injury as concentrations increased. Gram, peas, lentil, and linseed plants were severely affected at concentrations > 1.5 ppm. No phytotoxic symptoms were observed in a cotton crop subsequently grown on the plots.

81-3353. Buschmann, C.; Grumbach, K. H.; Bach, T. J. (Botl. Inst. (Plant Physiol.), Univ. Karlsruhe, D-7500 Karlsruhe, BRD) Herbicides which inhibit photosystem II or produce chlorosis and their effect on production and transformation of pigments in etiolated radish seedlings (*Raphanus sativus*). *Physiol. Plant.* 49(4): 455-459; 1980 (16 references).

Carotenoid and protochlorophyll(ide) composition was determined in radish seedlings grown in the dark in water containing the photosystem II herbicides DCMU (diuron) and bentazon, and the bleaching herbicides amitrole and SAN 6706 (metflurazon). The herbicides, at concentrations ranging from 10^{-4} to 10^{-5} *M*, were present during soaking (2 hr) and germination. The pigments were determined in 6-day-old seedlings, which were grown with and without phytochrome activation. Data indicate that the herbicides tested do not alter the nature of the pigments, but do have a slight influence on the quantities of pigments. SAN 6706 suppressed the biosynthesis of carotenoids, while bentazon enhanced the formation of lutein and carotenes. Amitrole led to a reduced accumulation of phototransformable protochlorophyll(ide) . A comparison of *in vivo* absorption spectra of control plants and treated plants indicates that the etioplasts of herbicide-treated plants possess the same chlorophyll-protein-complexes as those of the control plants.

81-3354. Donald, W. W.; Shimabukuro, R. H. (Dep. Bot. & Plant Pathol., Colorado State Univ., Fort Collins, CO 80523) Selectivity of diclofop-methyl between wheat and wild oat: growth and herbicide metabolism. *Physiol. Plant.* 49(4): 459-464; 1980 (31 references).

Susceptible wild oat (*Avena fatua* L.) and resistant wheat (*Triticum aestivum* L.) were treated with the herbicide diclofop-methyl in tests designed to determine whether differences in metabolism are the basis for the difference in susceptibility. When plants in the 1.5 leaf stage were dipped for 30 sec in a 1 m*M* solution of diclofop-methyl, growth of the second leaf of the wild oat was inhibited within 2 days, while leaf growth of resistant wheat was unaffected. In metabolism tests using labeled diclofop-methyl, foliar absorption by the 2 plants was similar, and very little diclofop-methyl remained in plant tissues 2 days after leaf treatment in both susceptible and resistant plants. Growth inhibition in susceptible plants occurred very rapidly and at relatively low concentrations. The most significant difference found was the fact that the wild oat and wheat formed different conjugates. The susceptible wild oat predominantly conjugated diclofop to an ester conjugate. Wheat hydroxylated the 2,4-dichlorophenyl ring and formed a phenolic conjugate. Possible mechanisms for the differences in susceptibility are discussed.

81-3355. Howell, C. R.; Stipanovic, R. D. (Natl. Cotton Pathol. Res. Lab., SEA, USDA, College Station, TX 77840) Suppression of *Pythium ultimum*-induced damping-off of cotton seedlings by *Pseudomonas fluorescens* and its antibiotic, pyoluteorin. *Phytopathology* 70(8): 712-715; 1980 (7 references).

Studies were conducted on the effects of *Pseudomonas fluorescens* on the fungus *Pythium ultimum*, which causes damping off in cotton. Agar plates growing *P. Fluorescens* (strain Pf-5) were inoculated with PDA plugs of *Pythium ultimun*. After incubation, there was reduced growth of the fungus in the area of the plugs. The antibiotic pyoluteorin was isolated from the bacteria. The isolate was also found to be inhibitory to the fungus. The treatment of seeds with either the bacteria or the isolate proved effective against *P. ultimum*. However, treatment of the soil with pyoluteorin was not effective, presumably because of inactivation by soil colloids.

81-3356. Yu, Y. B.; Adams, D. O.; Yang, S. F. (Dep. Veg. Crops, Univ. California, Davis, CA 95616) Inhibition of ethylene production by 2,4-dinitrophenol and high temperature. *Plant Physiol.* 66(2): 286-290; 1980 (25 references).

Mung bean seeds were germinated in Vermiculite for 3.5 days. Twenty 2-cm long hypocotyl segments, 1-3 cm below the hook, were incubated in 5 ml medium consisting of 2% sucrose, 50 μg/ml chloramphenicol, 50 n*M* Mes buf-

fer (pH 6.1), and various concentrations of IAA, IPA, ACC, DNP, or labeled methionine in a flask. By comparing the characteristics of ethylene production in auxin-dependent and ACC-dependent systems, it was expected to be possible to determine whether an inhibitor exerted its effect by interfering with a reaction prior to, or subsequent to, the formation of ACC. At 0.1 n*M*, DNP inhibited ethylene production by about 80% in either IAA- or ACC-treated tissues. Over a range of 10^{-6} to 10^{-3} *M*, inhibition by DNP increased progressively from 10 to 100%. The concentration of DNP required for 50% inhibition of ethylene production in both systems was about 20 μM. Carbonylcyanide m-chlorophenylhydrazone was a more potent inhibitor than DNP. DNP apparently inhibits the conversion of ACC to ethylene. Both ACC synthesis and degradation of ACC to ethylene were increased as temperatures were raised, but the increase in ACC synthesis exceeded the degradation of ACC to ethylene, resulting in a net increase of ACC. Conversion of ACC to ethylene was more sensitive to high temperature than was the synthesis of ACC.

81-3357. Gougler, J. A.; Geiger, D. R. (Dep. Biol., Univ. Dayton, Dayton, OH 45469) **Uptake and distribution of *N*-phosphonomethylglycine in sugar beet plants.** *Plant Physiol.* 68(3): 668-672; 1981 (16 references).

Studies were performed to determine the uptake and distribution of the nonselective post-emergence herbicide glyphosate by sugar beet plants. The plants were grown in controlled chambers with a 14-hr light, 10-hr dark cycle. [^{14}C]Glyphosate and [^{3}H]sucrose were applied in separate spots to 1 mature leaf on each plant. After uptake, the plants were divided into leaves, crown, beet, taproot, and fibrous root; homogenized, extracted, and assayed for both ^{3}H- and ^{14}C-labeled material. Other experiments were performed to determine the effects of pesticide concentration and pH on uptake and distribution. Concentrations in leaves reached 2.5 to 13.7 μM in 10 hr when exposed to a 15 m*M* solution. Uptake appears to be by a passive, nonfacilitated mechanism that is not affected by pH. Distribution of the pesticide followed that of the labeled sucrose, indicating that transport by phloem is the primary means by which glyphosate is distributed.

81-3358. Bajaj, K. L.; Mahajan, R. (Dep. Veg. Crops, Landscaping, & Floriculture, Punjab Agric. Univ., Ludhiana 141004, India) **Effects of nematicides on the chemical composition of the fruits of egg-plant (*Solunum melongena.*).** *Qual. Plant. Plant Foods Hum. Nutr.* 30(1): 69-72; 1980 (4 references).

The effects of several nematicides on the chemical composition of eggplant were investigated. A test plot was treated (randomized block design) with 3 replicates of 5 pesticides: aldicarb (4 kg/ha); carbofuran (4 kg/ha); phorate (10 kg/ha); fensulfothion (10 kg/ha); and DBCP (20 l/ha). Two wk after the soil treatment, eggplant seedlings were transplanted. Prior to treatment, the soil contained 360 nematode larvae/250 ml soil. The percent dry matter of eggplant did not decrease; however, crude protein decreased from 24.27 g/100 g to 18.31-22.41 g/100 g. Phenols in the controls were 2.247 g/100 g. Phorate resulted in an increase in phenols to 3.000 g/100 g and carbofuran resulted in a phenol level of 2.200 g/100 g. All others resulted in phenol levels lower than controls. Solasodine, the major alkaloid responsible for bitter flavor in eggplant, increased from 1257.66 μg/100 g, in controls, to 1546.66-1757.33 μg/100 g as a result of all pesticides.

81-3359. Mohanty, S. K.; Lodh, S. B.; Chakrabarti, N. K. (Cent. Rice Res. Inst., Cuttack 753006, India) **Effect of fungicidal application on the chlorophyll content of rice leaves.** *Sci. Cult.* 46(11): 405-407; 1980.

The high yielding rice cultivar *Ratna* was grown in earthen pots, each filled with 4 kg of well-sieved field soil and containing 4 seedlings. Ammonium sulfate was added to supply nitrogen at 350 ppm/pot. Six fungicides were sprayed 4 times during the crop season at 2 different dosages. The fungicides included Hinosan (edifenphos), Dithane M-45, captafol (mancozeb), duter (fentin hydroxide), aureofungin, and blasticidin-S. Duter brought down the total chlorophyll content of rice leaves to some extent at both seasons of application. The heavy metal present in this fungicide may have inhibited the synthesis of chlorophyll by interacting with the Mg-ion of the chlorophyll molecule. Significant increase was noted in the total chlorophyll content of rice leaves at both dosages of blasticidin-S in Rabi Season. In Kharif season, significant increases were noted in total chlorophyll content at both dose levels of captafol. Spraying of the fungicides captafol and blasticidin-S affected the synthesis of chlorophyll, but the antibiotic aureofungin did not alter chlorophyll synthesis.

81-3360. Smith, R. J. (Author address not given.) **Administration set to assist hazardous product exports.** *Science* 214(4516): 36-37; 1981.

Proposed changes in laws governing the export of toxic chemicals, unregistered pesticides, unapproved medical devices, and unapproved electrical products that emit hazardous amounts of radiation are discussed. Under the present laws the US EPA notifies foreign governments of the first shipment each year of a particular unapproved toxic chemical. About 180 such notices were issued last year. The view of industry is that they have suffered a regulatory burden from which little benefit can be derived. They suggest that notices of the hazards of specific exports may prejudicially direct attention to them, causing a loss of business revenue. Proposed policy changes would no longer require notification of other countries when they are about to receive a shipment of hazardous products that are barred for US domestic use.

81-3361. Morton, J. F. (Morton Collectanea, Univ. Miami, Coral Gables, FL 33124) **Malathion safety record.** *Science* 214(4517): 134; 1981.

This letter to the editor briefly discusses a successful malathion aerial spraying program carried out in Florida in 1956 to eradicate the Mediterranean fruit fly. Measures were taken to protect beehives, fish farms, auto painters, and so forth, and there was no indication of health hazards resulting from the application of the chemical. Based on this experience, Florida authorities recommended aerial spraying in California at the start of the fly problem in that state.

81-3362. Adzhemyan, L. A. (Sci. Res. Inst. Plant Protection, Min. Agric. Armenian SSR, Erevan, ARSSR) **Effects of the insecticides phosalone and Gardona on content of sugars, organic acids, and amino acids in apple leaves.** *Sov. Plant Physiol.* 27(1): 119-122; 1980 (6 references).

Trees were sprayed with 0.2% solutions of phosalone and Gardona (tetrachlorvinphos) 3 times during apple growing to combat apple worm. Samples of leaves were taken for analysis 1, 3, 6, 10, and 20 days after the first and second treatments, as well as 30 days after the third treatment. Regardless of the date of application, phosalone increased the accumulation of sucrose and fructose in the leaves during the first 6 days after treatment. Glucose content changed significantly under the influence of phosalone. During the first 3 days after treatment with Gardona the accumulation declined to a level below the control between days 6 and 10, and returned to control levels later. Organic acid content declined or remained at control levels during the first 6 days after treatment with phosalone. Organic acid content decreased during the first 3 days after Gardona treatment. It is suggested that both insecticides also influence respiration. After treatment with Gardona, leaf amino acid content changed in a manner analogous to sugar content changes. Between days 6 and 10 the free amino acid content declined in Gardona-treated leaves.

81-3363. Rogers, C. E. (Texas Agric. Exp. Stn., Agric. Res., SEA, USDA, Bushland, TX 79012) **Natural enemies of insect pests of sunflower: a world review.** *Tx. Agric. Exp. Stn. Misc. Publ.* 1457: 1-30; 1980 (73 references).

A bibliography containing 73 citations covering work done in the field of the natural enemies of insect pests of sunflower (*Helianthus annus* L.) is presented. Information on arthropod pests, the stage at which they can be attacked, their potential biological control agents, the country in which the work was performed, and a bibliographical reference number is tabulated. The order and family of the natural enemies is also coded in the table and explained in an appendix. As pest management in sunflower production becomes more important, the use of biological control agents for this purpose will most likely increase.

81-3364. Dimond, J. B.; Spies, C. J., III (Dep. Entomol., Univ. Maine, Orono, ME 04469) **A comparison of BT alone with BT plus the additives chitinase and Orthene in control of eastern spruce budworm.** *Univ. Maine Orono Misc. Publ.* 224: 15 pp.; 1980 (9 references).

Thuricide 16B (*Bacillus thuringiensis*) was applied to 20 100-acre (40.5-ha) forest plots at a rate of 64 fluid oz (1.89 l) and 16 fluid oz (0.47 *l*) water/acre. This provided an active dose of 8 billion International Units of BT/acre (197 BIU/ha). In some cases, chitinase was added to the Thuricide 16B at a rate of 4000 nephelometric units (33 mg)/acre (~ 80.49 mg/ha). In some cases, Orthene (AI acephate) was added at a rate of 0.8 oz (22.7 g) of active acephate/acre (~ 55.37 g/ha). The distribution of budworm larvae by developmental stage in samples taken from 3 plots on the day before spraying was 4%, 41%, 48%, and 7% for instars II through V, respectively. All treated plots were significantly lower in population then control plots in the postspray counts, but there was no significant difference among the 3 spray treatments. With the counts on red spruce, no significant differences could be shown in either the prespray or the postspray counts between treated and untreated plots. While defoliation studies using balsam fir and red spruce showed significant differences in defoliation between treated and untreated plots, no significant differences were noted for the different types of treatment. Treatment with BT alone and BT plus chitinase showed typical retardation of pupation and disproportionate numbers in instars IV and V. This was not noted in plots treated with BT plus Orthene. These findings suggest that that additives chitinase and Orthene did little or nothing to enhance the activity of BT under the conditions of this test.

81-3365. Dimond, J. B.; Spies, C. J., III; O'Neal, J. (Dep. Entomol., Univ. Maine, Orono, ME) **Spruce budworm: evaluation of BT trials in Maine, 1980.** *Univ. Maine Orono Misc. Publ.* 237: 1-15; 1981 (3 references).

Applications of Dipel and Thuricide (*Bacillus thuringiensis* formulations) were made at 8 BIU/acre in the Moosehead Lake region of Maine in 1980. The level of active ingredient was the same in all treatments; however, the dilution rate and resulting spray emission rates/acre varied. Dipel was applied at spray emission rates of 1, 0.5, and 0.25 gal/acre (9.35, 4.7, and 23.4 l/ha) and Thuricide at 1 and 0.5 gal/acre. Poor performance of Thuricide occurred, possibly because those plots were exposed to more rain and excessive insect numbers (> 30/branch). Prolonged cool, wet weather was found to decrease the activity and feeding of the budworm. Little difference in efficiency was noted between the treatments of 1 and 0.5 gal/acre.

81-3366. White, J. W. (Rehab. Group Inc., Falls Church, VA) **Feasibility study of an integrated pest management information dissemination system.** *US NTIS PB Rep.*PB81-179,095: 228 pp.; 1980 (258 references).

Integrated pest management is an approach to pest control which maximizes the effectiveness of natural controls of pest population and reduces the need for application of chemical pesticides. The concept of integrated pest management has been demonstrated to be economically feasible, efficacious, and environmentally effective with specific crops. This study seeks to establish the requirements for, and the feasibility of, an effective system for IPM information dissemination. (Author abstract by permission)

81-3367. Campbell, T. A.; Gentner, W. A.; Danielson, L. L. (Agric. Res., SEA, USDA, Beltsville, MD 20705) **Evaluation of herbicide interactions using linear regression modeling.** *Weed Sci.* 29(4): 378-381; 1981 (10 references).

Interactions of 9 dosage rates each of chloramben (3-amino-2,5-dichlorobenzoic acid) and diphenamid (*N,N*-dimethyl 2,2-diphenylacetamide) were studied using Italian ryegrass (*Lolium multiflorum* Lam.) as a test species. Injury score, estimated percent stand reduction, height, and fresh wt data were taken 1 wk after seeding. Techniques for developing linear regression models based on these data and evaluating them graphically in terms of completeness and statistical validity are discussed. Three-dimensional graphs of these models indicate areas of possible herbicide interaction. (Author abstract by permission)

81-3368. Ndon, B. A.; Harvey, R. G. (Dep. Agron., Univ. Wisconsin, Madison, WI 53706) **Effects of seed and root lipids on the susceptibility of plants to trifluralin and oryzalin.** *Weed Sci.* 29(4): 420-425; 1981 (19 references).

Extensive variability in total lipid composition was observed in seeds of different plant species as well as cultivars within the same species. Susceptibility of plants to soil-incorporated trifluralin (α,α,α-trifluoro-2,6-dinitro-*N*, *N*-dipropyl-*p*- toluidine) and oryzalin (3,5-dinitro-N^4, N^4-dipropylsulfanilamide) under greenhouse conditions decreased as the percentages of total lipid in dry seeds increased. Species with high seed lipid levels such as jimsonweed (*Datura stramonium* L.), soybean [*Glycine max* (L.) Merr.], and velvetleaf (*Abutilon theophrasti* Medic.) were less susceptible to these herbicides than were oat [*Avena sativa* (L.), giant foxtail (*Seteria fabern* Herrm.), and sorghum [*Sorghum bicolor* (L.) Moench.] with low seed lipid levels. Velvetleaf was the most tolerant to the herbicides. Corn (*Zea mays* L.) cultivars with a wide range of seed lipid content (4.45-17.0% of dry wt) were germinated in herbicide-free soil, but their roots were allowed to grow through trifluralin- or oryzalin-treated soil. Roots of seedlings from seeds with high lipid content had higher lipid contents than those from low-lipid seeds. There was a significant correlation between root lipid content and sensitivity to trifluralin or oryzalin. Roots high in lipids were less susceptible than those with low amounts of lipids. Similiar results were obtained for oat cultivars. The fatty acid composition of plant roots differed among plant species and also among cultivars of the same species. The individual fatty acids did not significantly correlate with susceptibility of roots to trifluralin or oryzalin. Root lipid and fatty composition were not significantly altered by trifluralin or oryzalin treatment. (Author abstract by permission)

81-3369. Morrison, I. N.; Owino, M. G.; Stobbe, E. H. (Dep. Plant Sci., Univ. Mannitoba, Winnipeg., Manitoba R3T 2N2, Canada) **Effects of diclofop on growth, mitotic index, and structure of wheat (*Triticum aestivum*) and wild oat (*Avena fatua*) adventitious roots.** *Weed Sci.* 29(4): 426-432; 1981 (17 references).

Methyl ester of diclofop [2-[4-(2,4-dichlorophenoxy) phenoxyl propanoic acid] (diclofop as used herein refers to the methyl ester) added to nutrient solution inhibited adventitious root development and reduced the mitotic index in adventitious root tips of wheat (*Triticum aestivum* L. Neepawa) and wild oat (*Avena fatua* L.). Elongation of wild oat roots was significantly inhibited by 0.15 μ*M* diclofop 24 hr after treatment; whereas, wheat roots were unaffected at concentrations less than 1.5μ*M* even at 12 days, indicating at least a 10-fold difference in sensitivity. Initiation of new adventitious roots was reduced in both species by 0.30 μ*M* diclofop. Mitotic index was more severely reduced at lower concentrations and after a shorter exposure in wild oat than in wheat. Histological studies showed that 24 hr after wild oat roots were treated with 0.30 μ*M* diclofop for 24 hr, severe damage occurred to tissues within the developing central cylinder, close to the root apex. Disruption of cortical and epidermal cells generally was not as severe until 4 to 7 days after treatment. By 12 days the entire root tip was almost completely obliterated, with only the epidermal cell walls remaining intact. (Author abstract by permission)

81-3370. Hoagland, R. E.; Duke, S. O. (South. Weed Sci. Lab., Agric. Res., SEA, USDA, Stoneville, MS 38776) **Effects of herbicides on growth and extractable phenylalanine ammonia-lyase activity in light- and dark-grown soybean (*Glycine max*) seedlings.** *Weed Sci.* 29(4): 433-439; 1981 (44 references).

Effects of 16 herbicides representing 14 herbicide classes on growth and extractable phenylalanine ammonia-lyase (PAL, EC 4.3.1.5) were examined in light- and dark-grown soybean [*Glycine max* (L.) Merr. Hill] seedlings. High purity (96-100%) herbicides were supplied via aqueous culture at various concentrations: 0.5 m*M* amitrole (3-amino-s-triazole), 0.1 m*M* atrazine [2-chloro-4-(ethyl- amino)-6-(isopropylamino) -s-triazine], 0.07 m*M* diclofop-methyl [methyl ester of 2-[4-(2,4-dichlorophenoxy) phenoxy]propanoic acid], 0:5 m*M* DMSA (disodium methanearsonate), 0.2 m*M* fenuron (1,1-dimethyl-3- phenylurea), 0.05 m*M* fluridone

[1-methyl-3-phenyl-5-[3-(trifluoromethyl) phenyl]-4(1H)pyridinone], 0.5 m*M* MH (1,2-dihydro-3,6-pyrdazinedione), 0.5 m*M* metribuzin [4-amino-6-*tert*-butyl-3-(methylthio)-*as*-triazin-5(4*H*)-one], 1.8 μM nitralin [4-(methylsulfonyl)-2,6-dinitro-*N*,*N*-dipropylaniline], 0.5 m*M* norflurazon [4-chloro-5-(methylamino)-2-(α,α,α-trifluoro-*m*-tolyl)-3(2H)-pyridazinone], 0.05 m*M* paraquat (1,1′-dimethyl-4,4′-bipyridinium ion), 0.15 m*M* perfluidone [1,1,1-trifluoro-*N*-[2-methyl-4-(phenylsulfonyl)phenyl]methanesulfonamide, 0.2 m*M* propanil (3′,4′-dichloropropionanilide), 0.1 m*M* propham (isopropyl carbonilate), 0.5 m*M* TCA (trichloroacetic acid), and 0.05 m*M* 2,4-D [(2,4-dichlorophenoxy) acetic acid]. Dark-grown soybean seedlings (3-day-old) were transferred to control solutions (2 m*M* $CaSO_4$) or to herbicide solutions (in 2 m*M* $CaSO_4$) and grown at 25°C in continuous white light (200 $\mu E \cdot m^{-2} \cdot s^{-1}$) or continuous darkness until harvested 24 or 48 hr after transfer. After 48 hr, growth (fresh wt, dry wt, elongation) was inhibited by most of the chemicals. Other signs of toxicity (necrosis, secondary root stunting, and root tip swelling) were noted for some treatments. Roots were most affected, although hypocotyls were generally not changed. Hypocotyl elongation was stimulated by atrazine, fluridone, and norflurazon after 48 hr light. Extractable PAL activity from soybean axes was decreased by atrazine, fenuron, metribuzin, norflurazon, propanil, propham, and 2,4-D. Amitrole and paraquat were the only herbicides that increased extractable PAL activity. Other compounds tested had no effect on the enzyme. None of the herbicides significantly affected *in vitro* PAL activity. (Author abstract by permission)

81-3371. York, A. C.; Slife, F. W. (Crop Sci. Dep., North Carolina State Univ., Raleigh, NC 27650) **Interaction of buthidazole and acetanilide herbicides.** *Weed Sci.* 29(4): 461-468; 1981 (22 references).

In field and greenhouse studies, alachlor [2-chloro-2′,6′-diethyl-*N*-(methoxymethyl) acetanilide] was found to antagonize buthidazole [3-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-4-hydroxy-1-methyl-2-imidazolidinone] injury to corn (*Zea mays L.*) when both herbicides were preplant incorporated. Similar results were found with 5 of 7 other acetanilide herbicides tested. The antagonism between buthidazole and alachlor also occurred with common cocklebur (*Xanthium pensylvanicum* Wallr.) and ivyleaf morningglory [*Ipomoea bederacea* (L.) Jacq.] but not with 5 other weed species. Preplant-incorporated applications of alachlor had little to no effect on the response of corn to postemergence applications of buthidazole, but alachlor increased the susceptibility of ivyleaf morningglory to postemergence applications of buthidazole. No antagonism was observed when alachlor was included in postemergence applications of buthidazole to corn or ivyleaf morningglory. (Author abstract by permission)

81-3372. Streibig, J. C. (Dep. Crop Husb. & Plant Breed., R. Vet. & Agric. Univ., Taastrup, Denmark) **A method for determining the biological effect of herbicide mixtures.** *Weed Sci.* 29(4): 469-473; 1981 (14 references).

Experiments were conducted in growth chambers by growing oats (*Avena sativa* L. Ansi) in water culture and soil with admixed TCA (trichloroacetic acid), pyrazon [5-amino-4-chloro-2-phenyl-3-(2H)-pyridazinone], and 2 mixtures (pyrazon: less TCA; 1:25 and 1:50). The sigmoid log-dose relationship for dry-matter yield was fitted with a 4-parameter logistic equation. Generally, the mixtures appeared to be less active than would be expected under an additive dose model. Around GR50 the departure of joint action of the mixtures from the reference model was almost similar in the 2 growth media. At higher dose levels the mixtures approached the reference model, and the bioactivity of one mixture (1:25) in the water culture experiment even showed a higher activity than would be expected from the reference model. (Author abstract by permission)

81-3373. Ritter, R. L.; Coble, H. D. (Dep. Agron., Univ. Maryland, College Park, MD 20742) **Penetration, translocation, and metabolism of acifluorfen in soybean (*Glycine max*), common ragweed (*Ambrosia artemisiifolia*), and common cocklebur (*Xanthium pensylvanicum*).** *Weed Sci.* 29(4): 474-480; 1981.

Penetration translocation, and metabolism of acifluorfen [5-[2-chloro-4-(trifluoromethyl) phenoxy]-2-nitrobenzoic acid] in soybean [*Glycine max* (L.) Merr. Ransom], common ragweed (*Ambrosia artemisiifolia* L.), and common cocklebur (*Xanthium pensylvanicum* Wallr.) were studied. Using liquid scintillation spectrometry and autoradiography, little movement of ^{14}C-acifluorfen from the leaf surfaces of the 2 weed species could be detected in 24 hr. After 48 hr, less ^{14}C was recovered from the leaf surface and more was found within the leaves of the 2 weed species. Autoradiographs of the weed showed limited acropetal movement of ^{14}C from leaves 24 and 48 hr after treatment. For soybean, most of the ^{14}C still remained on the leaf surface after 48 hr. Autoradiographs of soybean plants showed no movement from the treated leaflet. Studies using thin layer chromatography suggested that acifluorfen was metabolized within the plants. Rate of metabolism was inversely related to plant susceptibility (common ragweed and common cocklebur > soybean). The more rapid penetration and translocation, coupled with slower metabolism of acifluorfen by the weed species in comparison to soybean, may account for the difference in susceptibility of the weeds and soybean to acifluorfen. (Author abstract by permission)

81-3374. Donald, W. W. (Metab. & Radiat. Res. Lab., SEA, USDA, Fargo, ND 58105) **EPTC effects in the let-**

tuce (*Lactuca sativa*) hypocotyl bioassay for gibberellins. *Weed Sci.* 29(4): 490-499; 1981 (17 references).

EPTC (S-ethyl dipropylthiocarbamate) reduces hypocotyl growth of lettuce [*Lactuca sativa* (L.) Grand Rapids] seedlings in response to gibberellic acid (GA_3) in the lettuce hypocotyl bioassay. Doses of 0.01, 0.1, and 1.0 m*M* EPTC were effective over a range of gibberellin concentrations. Significant reductions in hypocotyl growth in response to all doses of EPTC and GA^3 at 7.68 μg/ml occurred between 12 and 24 hr after initial treatment. In a 72-hr experiment, pulse treatments of EPTC at 0.01, 0.1, and 1.0 m*M* plus GA_3 at 7.68 μg/ml for only 1 or 2 hr at the beginning reduced the subsequent response of the bioassay when plants were transferred to GA_3 alone for the remaining 71 or 70 hr, respectively. Final hypocotyl growth in GA_3 at 7.68 μg/ml was reduced by exposure to EPTC at 0.01, 0.1, and 1.0 m*M* plus GA_3, at any time during the entire 72 hr test period. The interaction between EPTC and GA_3 was not due to herbicide-induced precipitation nor decomposition of GA_3 in the medium. This was demonstrated by separation of [714C]-GA_3 in 4 thin-layer chromatography solvent systems after incubation in the presence or absence of 1.0 m*M* EPTC for 48 hr. Apparently EPTC can reduce the growth response of sensitive species to exogenous gibberellins in addition to its effects on endogenous gibberellin-like substances or gibberellin biosynthesis. (Author abstract by permission)

81-3375. Quakenbush, L. S.; Wilson, R. G. (Dep. Agron. & Plant Genet., Univ. Minnesota, St. Paul, MN 55108) **Effect of herbicide and manure applications on soil chemistry and growth of fieldbeans (*Phaseolus vulgaris*).** *Weed Sci.* 29(4): 508-512; 1981 (16 references).

The influence of manure and herbicide applications on weed-free fieldbeans (*Phaseolus vulgaris* L.) and root rot of fieldbeans was studied during 1978 and 1979 at Scottsbluff, Nebraska. Rates of cattle feedlot manure used were 0, 30,000, 56,000, 112,000, or 168,000 kg/ha. Preplant herbicide treatments used were alachlor [2-chloro-2′,6′-diethyl-*N*-(methoxymethyl) acetanilide] at 3.4 kg/ha, EPTC (S-ethyl dipropylthiocarbamate) at 3.4 kg/ha, EPTC + trifluralin (α,α,α-trifluoro-2,6-dinitro-*N*,*N*-dipropyl-*p*-toluidine) at 2.2 + 0.6 kg/ha, or dinoseb (2-*sec*-butyl-4,6-dinitrophenol) at 6.7 kg/ha. Manure rates of 56,000 kg/ha or higher reduced fieldbean yields both years, but did not increase electrical conductivity or soil exchangeable sodium enough to explain these yield reductions. In 1978, but not in 1979, height and yield of weed-free field beans were reduced by EPTC, EPTC + trifluralin, and alachlor treatments. A significant interaction between manure and herbicide treatments was not detected and none of the treatments increased the severity of root rot in either year. (Author abstract by permission)

81-3376. Kitchen, L. M.; Witt, W. W.; Rieck, C. E. (Dep. Plant Pathol. & Crop Physiol., Louisiana State Univ., Baton Rouge, LA 70803) **Inhibition of chlorophyll accumulation by glyphosate.** *Weed Sci.* 29(4): 513-516; 1981 (19 references).

Glyphosate [*N*-(phosphonomethyl) glycine] significantly decreased the chlorophyll content of field-grown soybeans (*Glycine max* L. Merr. Williams) within 48 hr after a 2.24-kg/ha treatment. In laboratory studies, 0.0001, 0.001, 0.01, 0.1, and 1 m*M* glyphosate reduced chlorophyll content of 7-day-old etiolated barley (*Hordeum vulgare* L. Barsoy) shoots 8, 12, 25, 49, and 77%, respectively, following 8 hr dark incubation and 24 hr illumination. Reduction of chlorophyll accumulation ranged from 6% with 0.001 m*M* glyphosate to 82% with 1.0 m*M* glyphosate. In studies with 8-day-old etiolated corn (*Zea mays* L. Pioneer Brand 3535) shoots, 0.1 1.0, and 10.0 m*M* glyphosate decreased chlorophyll content of corn shoots 24, 42, and 50%, respectively, after 12 hr of illumination. The rate of chlorophyll accumulation in corn shoots was significantly reduced 64% by 1.0 m*M* glyphosate over a 15-hr illumination period. These rapid and substantial effects on chlorophyll accumulation suggest that interference with greening may be important in the mechanism of action of glyphosate. (Author abstract by permission)

81-3377. Foerster, H.; Buchenauer, H.; Grossmann, F. (Dep. Plant Pathol., Univ. California, Riverside, CA 92521) **Nebenwirkungen der systemischen Fungizide Triadimefon und Triadimenol auf Gerstenpflanzen. I. Beeinflussung von Wachstum und Ertrag. [Side-effects of the systemic fungicides triadimefon and triadimenol on barley plants. I. Influence on growth and yield.]** *Z. Pflanzenkr. Pflanzenschutz* 87(8): 473-493; 1980 (20 references) (German).

The effect of treating 100 kg of barley seedstock with 25-100 g of triadimefon or triadimenol on the growth of the culture and crop yield were studied in pot and field experiments. Initially, growth inhibition of roots, shoots and coleoptiles of barley seedlings occurred; inhibition was more pronounced in pot than in field tests. No differences from untreated cultures were exhibited by 30-day-old cultures. Simultaneous treatment with gibberellic acid mitigated the initial morphological changes, which are attributed to inhibition of phytosterin biosynthesis as a result of the impact of the test substances on gibberellic acid metabolism. Germination was unaffected by the treatment. Initially culture density was reduced by 13%; this disappeared as the crop matured. Residue analysis disclosed rapid disappearance of the fungicides due to decomposition. In plants sprayed with triadimefon, conversion of the active substance to 2 triadimenol decomposition compounds was noted.

81-3378. Willis, G. H.; McDowell, L. L.; Smith, S.; Southwick, L. M.; Lemon, E. R. (Soil & Water Pollut. Res. Unit., Agric. Res., SEA, USDA, Baton Rouge, LA 70893) **Toxaphene volatilization from a mature cotton canopy.** *Agron. J.* 72(4): 627-632; 1980 (30 references).

Toxaphene was applied aerially as an emulsifiable concentration at a rate of 2.24 kg/ha on 14 and 20 August and on 6 September, 1974 to a 25-ha cotton field in Mississippi. The 201 g/ha toxaphene load present in the crop canopy 1 hr after application on 14 August represented 9% of that applied. Little of the aerially applied toxaphene penetrated the 165 cm thick canopy to reach the soil surface. The calculated volatile loss for the 5-day period following aerial application was 358 g/ha, which represented a loss of 26% of the toxaphene present in the canopy. While typical volatile loss patterns suggested that flux densities were highest during the mid afternoon, evidence also suggested that volatility rates were high when the leaves were drying after heavy dew or light rain. Studies in cotton fields adjacent to the experimental site showed that about 100 g/ha/yr of toxaphene were transported in runoff and sediments during 2 high rainfall years. The calculated volatile loss of about 350 g/ha of toxaphene in 4-5 days after application demonstrates that volatilization and subsequent aerial transport is the major pathway of toxaphene transport from the cotton fields.

81-3379. Haefner, M. (Landesanst. Pflanzenschutz, D-7000 Stuttgart 1, BRD) **Zu Frage von Chlorfenvinphos- und 2,2',4'-Trichloroacetophenon- Rueckstaendem bei Gemuesekulturen und in gaertnerisch genutzten Erden. [Chlorfenvinphos and 2,2',4'-trichloroacetophenone residues in vegetables and horticultural soils.]** *Anz. Schaedlingskd. Pflanz. Umweltschutz* 53(7): 102-106; 1980 (German).

Samples of radishes, cucumbers, cress, and soils were analyzed to determine residues of chlorfenvinphos and trichloroacetophenone (hydrolysis product of chlorfenvinphos). The study resulted in the following conclusions. It appeared that chlorfenvinphos was completely metabolized within a defined period of time and thereafter was not detectable. Repeated applications of chlorfenvinphos containing plant protectives should not lead to a continued accumulation of the chemical in the soil. Trichloroacetophenone, which is the hydrolysis product of chlorfenvinphos, could not be detected in any soil sample studied even after the parent chemical was applied 30 times at the same site. It appeared that the establishment of a tolerance for trichloroacetophenone in vegetables was not necessary. The waiting time for harvesting after the application of Birlane Granulat (AI chlorfenvinphos) to radishes in Germany is 30 days, and the corresponding time for cucumbers is 60 days, each of which appears to be adequate based on these findings. Cress was found to contain higher chlorfenvinphos residues within a period of 3 mo and more after application of the chemical.

81-3380. Yamagishi, T.; Akiyama, K. (Tokyo Metrop. Res. Lab. Public Health, Hyakunin-cho, Shinjuku-ku, Tokyo, 160 Japan) **1,3,5-Trichloro- 2-(4-nitrophenoxy) benzene in fish, shellfish, and seawater in Tokyo Bay, 1977-1979.** *Arch. Environ. Contam. Toxicol.* 10(5): 627-635; 1981 (14 references).

Concentrations of 1,3,5-trichloro- 2-(4-nitrophenoxy) benzene (CNP) were measured in goby-fish, sea bass, shellfish, and seawater samples collected in the coastal waters of Tokyo Bay. The concentrations of CNP found in goby-fish were in the range of 2.6 to 91,400 ppb in liver, 0.1 to 360 ppb in muscle, trace to 2,900 ppb in short-necked clam, and not detectable to 1.9 ppb in seawater. Although the concentrations in the samples varied with time and place of sampling, the maximum levels were found in the samples obtained in May or June of 1977, 1978, and 1979. (Author abstract by permission)

81-3381. Saxena, M. C.; Siddiqui, M. K. J.; Bhargava, A. K.; Krishna Murti, C. R.; Kutty, D. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Placental transfer of pesticides in humans.** *Arch. Toxicol.* 48(2-3): 127-134; 1981 (19 references).

Transfer of organochlorine pesticides from mother to fetus has been studied in 100 women. The concentrations of organochlorine pesticides were examined in maternal blood, placenta, and umbilical cord blood of the same mother/child pair. Residue levels of dichlorodiphenyl trichloro ethane (DDT) and its metabolites, isomers of benzene hexachloride (BHC) and aldrin were detected in all the samples analyzed, indicating their transfer from mother to the fetus. A correlation was found to exist between the pesticide concentration and age, dietetic habits and area of residence of pregnant women. (Author abstract by permission)

81-3382. Maia, R.; Brant, P. C. (Setor Tecnol. Aliment., Cent. Technol. Minas Gerais, Belo Horizonte, MG, Brazil) **[Residuos de pesticidas clorados em carne bovina. [Chlorinated pesticide residues in beef.]** *Arq. Esc. Vet. Univ. Fed. Minas Gerais* 32(2): 271-276; 1980 (14 references) (Portuguese).

Gas chromatography with electron capture detector was used to examine 120 samples of beef cattle muscle for residues of chlorinated pesticides. The beef samples were taken from the State of Minas Gerais (Brazil) in efforts to determine the extent of chlorinated pesticide contamination in that area. α-BHC residues were found in 74.2% of the beef samples, lindane in 64.2%, dieldrin in 45.8%, and p,p'-DDT in 5%. A few individual samples did exceed the tolerance limits set by the WHO and the Brazilian government.

81-3383. Theodorou, C.; Sands, R. (Div. Soils, CSIRO, Glen Osmond, Australia 5064) **Effect of atrazine on**

nitrogen transformations in forest soils. *Aust. For. Res.* 10(2): 133-139; 1980 (13 references).

Mt Burr sand was packed in pots to a bulk density of 1.2 g/cm^3; herbicides were added as suspensions in 100 ml of distilled water to give concentrations to 0.3 and 3.0 ppm AI in oven-dry soil. Herbicides applied were atrazine, amitrole, and atrazine + amitrole. Pots were watered to a gravimetric water content of 0.1 g/g and maintained at this water level by watering to wt 3 times/wk. Similar experiments were also carried out in the field. Soil treated with atrazine at both concentrations had significantly greater total exchangeable nitrogen than soil treated with amitrole alone or in combination with atrazine. Nitrate nitrogen in soil with 3.0 ppm atrazine was significantly greater than with all other herbicide concentration combinations used. Incubation studies revealed that atrazine applied in the field trial had no effect on nitrogen mineralization, nitrifiction or ammonification when these processes were examined in laboratory studies with treated soils. Sterilization studies revealed no consistent differences between the atrazine treatments and no atrazine × sterility treatment interactions. Increased growth of radiata pine seedlings following atrazine application was suggested to result from a direct effect of atrazine on the plant.

81-3384. Johnson, J. S. (Soil Conserv. Serv., USDA, Washington, DC) **The role of conservation practices as best management practices.** In: *Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH07: 69-78; 1979 (16 references).

The soil conservation movement has played a significant role in the control of water pollution from nonpoint sources. Eroded soil particles serve to transport nutrients and pesticides that damage water quality. Effective soil conservation programs will be selected as best management practices (BMP) protocol. Concentration on critical areas is needed to design specific control programs. For example, no-till cultivation methods usually require greater applications of pesticides then conventional systems. More research into and monitoring of integrated soil conservation-water quality programs will be required to predict the overall effect on water quality. Cost-sharing programs are recommended to make the implementation of BMP practices more economically feasible.

81-3385. Coote, D. R.; MacDonald, E. M.; Dehaan, R. (Land Resour. Res. Inst., Cent. Exp. Farm, Agric. Canada, Ottawa, Ontario, Canada) **Relationships between agricultural land and water quality.** In: *Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH08: 79-92; 1979 (11 references).

Information gaps exist between small-scale plot studies and large-scale river basin or lake loading analyses in the study of the effects of agriculture on water quality. To bridge this gap, statistical relationships between the water quality at watersheds and their outlets were examined for several agricultural areas of the Canadian Great Lakes Basin. Soil particle size influences the P, organic N, Zn, and atrazine loadings from agricultural lands. In cultivated sections, remedial programs will be needed to reduce current loadings. For water-soluble materials, such as endosulfan, the amount of input must be reduced or the availability to the water system controlled to prevent excessive levels of the contaminant in runoff water. Other water pollutants, such as PCB and Cu, were unrelated to any aspect of agriculture and must be controlled by separate remedial programs.

81-3386. Baker, J. L.; Johnson, H. P.; Borcherding, M. A.; Payne, W. R. (Dep. Agric. Eng., Iowa State Univ., Ames, IA) **Nutrient and pesticide movement from field to stream: a field study.** In: *Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH16: 213-245; 1979 (21 references).

An extensive field study was conducted to elucidate relationships between management of farm systems and stream water quality, and mathematical models were used to analyze such systems. Sediment transport and nutrient erosion in agricultural watersheds were examined for various cases of land use and cultivation. Losses of pesticides in runoff were investigated in relation to hydrologic and management factors. When alachlor was applied to 28% of the Four Mile Creek watershed in east-central Iowa, its residues were detectable at a maxima of 0.1 ppm in water and 1 ppm in sediment due to surface runoff events occurring within 6 wk after herbicide application. Other pesticides studied included cyanazine, metribuzin, paraquat, and propachlor. The effects of phosphorus loading in agricultural drainage, which have often been blamed for accelerating eutrophication in lakes and reservoirs, were also studied.

81-3387. Li, R. M.; Eggert, K. G.; Simons, D. B. (Dep. Civil Eng., Colorado State Univ., Fort Collins, CO) **Simulation of stormwater runoff and sediment yield for assessing the impact of silviculture practices.** In: *Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH21: 295-307; 1979 (11 references).

Pesticides and many other water pollutants are transported by sediments through the environment; a sediment yield simulation plan (SEDWAT) was devised to calculate sediment yields in natural resource or silviculture management programs. The program application was based on a simplified watershed geometry consisting of 2 planes and 1 channel. A single plane model based on 3 assumptions may be used by planners without extensive knowledge of computer programming and advanced mathematics. The model is recommended for the quantitative and qualitative prediction of water and sediment yield and offers greater utility than more complex simulations.

81-3388. Ritter, W. F.; Jensen, P. A. (Agric. Eng. Dep., Univ. Delaware, Newark, DE) **Water quality modeling in the Delaware Coastal Plain Region.** In: *Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH35: 507-524; 1979 (24 references).

The calibration of the EPA Agricultural Runoff Model (ARM) and a one-dimensional water quality model and results of their use to evaluate the effects of point and nonpoint source loads on water quality of the Coastal Sussex 208 area of the Delaware Coastal Plain Region are described. The ARM simulated runoff, sediment, pesticide, and nutrient contributions to stream channels from both surface and subsurface sources. The one-dimensional model simulated biochemical oxygen demand and dissolved oxygen, nitrogen cycling, and coliform bacteria. Storm simulations were also added to the water quality model. Appropriate uses of each model are discussed. Projected urbanization in Coastal Sussex County by 1995 will have little effect on the water quality of the estuaries, and total coliform levels are expected to decrease.

81-3389. Davis, M. J.; Nebgen, J. W. (Midwest Res. Inst., Kansas City, MO) **Estimation of agricultural nonpoint loads to the Wakarusa River Basin using the nonpoint calculator.** In: *Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH36: 525-550; 1979 (2 references).

A simple mathematical model, the nonpoint calculator, may be used to estimate nonpoint source water pollution loads, pinpoint specific problems and estimate their severity, and develop alternative management strategies. The model stresses detection on nonpoint load sources to allow measures to be taken for prompt control of the problem. In the nonpoint calculator, pesticides are handled in the same manner as nutrients and are assumed to be carried along with sediments. Input data used for nutrients and pesticides for the Wakarusa River Basin of east-central Kansas is given. The nonpoint calculator model can reduce the time needed to pinpoint the source of nonpoint loads, thus freeing the user to explore corrective actions.

81-3390. Beyerlein, D. C.; Donigian, A. S., Jr. (Hydrocomp, Inc., Palo Alto, CA) **Modeling soil and water conservation practices.** *In: Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH44: 687-714; 1979 (16 references).

The use of the Agricultural Runoff Management (ARM) model in analyzing the relative effectiveness of alternative soil and water conservation practices for controlling pesticide runoff, sediment, and nutrient loss was evaluated. In general, minimum tillage, contours, and terraces plus contours all reduced surface runoff, sediment loss, and constituent loads. In studying the transport of pesticides in runoff, it was noted that the process of pesticide adsorption/desorption onto sediment particles was a major determinant of the amount of pesticide loss that occurred. Examples of reduced sediment transport of atrazine in the terraces-plus-contours system are given. Further work is needed on the use of the ARM model on erosion processes, tillage operations, the transport of soluble substances, pesticide adsorption and degradation mechanisms, and nutrient transformations.

81-3391. Dean, J. D.; Mulkey, L. A. (Technol. Dev. & Applications Branch, Environ. Res. Lab., US EPA, Athens, GA) **Interactive effects of pesticide properties and selected conservation practices on runoff losses: a simulation study.** In: *Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH45: 715-734; 1979 (28 references).

When selecting the optimum management practices for controlling pesticide losses in agriculture and silviculture, all known factors governing transport should be considered. Basic properties of the pesticide formulation, application timing, or mode of application may greatly influence the mechanism and magnitude of pollutant loss from the watershed. Continuous simulation hydrologic modeling is proposed as an alternative to expensive (and often inconclusive) field studies for determining the water pollution effects of agricultural and silvicultural activities. A program is recommended that uses field data for calibration and parameter estimation and modes for risk evalua-

tions associated with unsuccessful management attempts. The present model offers planners a viable set of options on which to base decisions for pesticide management.

81-3392. Levy, K. A.; Brady, S. S.; Pfaffenberger, C. D. (Dep. Epidemiol. & Public Health, Sch. Med., Univ. Miami, Miami, FL 33177) **Chlorobenzilate residues in citrus-worker urine.** *Bull. Environ. Contam. Toxicol.* 27(2): 235-238; 1981 (7 references).

Residues of the acaricide chlorobenzilate were determined in 35 urinary collections obtained from 5 male citrus-grove fieldworkers over a period of 23 days. During spray operations, the workers rode in tractors covered only by a canopy, and wore no protective gear (respirators, face masks). Chlorobenzilate was analyzed as *p,p'*-dichlorobenzophenone (DBP) by a gas chromatographic method (limit of detection 2 ppb; average recovery 97%). Urinary values obtained from workers ranged from 0.07 to 6.2 ppm, with an overall average value of 1.3 ppm. By comparison, non-exposed humans averaged < 0.01 ppm urinary DBP.

81-3393. Addison, J. B. (Div. Sci., Coll. Arts & Sci., Governors State Univ., Park Forest South, IL 60466) **Vapour phase photochemistry of fenitrothion and aminocarb.** *Bull. Environ. Contam. Toxicol.* 27(2): 250-255; 1981 (7 references).

Studies were carried out in which aminocarb and fenitrothion vapors were irradiated under field and laboratory conditions. Formulations were sprayed from an airplane; sampling stations were 50, 230, 405, and 672 m downwind. Sunlight intensity was about 8000 ft-candles. In the laboratory, the compounds were placed on a glass dish and vaporized by heat. Dry air with and without ozone was passed over the dish. Vapors were irradiated and samples were collected and analyzed. Field tests indicate that no photoconversion products were formed. This suggests that droplets did not evaporate while airborne. Photoconversion products were produced in the laboratory, especially in the presence of ozone. It is suggested that photoconversion could occur depending on certain environmental conditions, such as ozone concentration.

81-3394. Skaar, D. R.; Johnson, B. T.; Jones, J. R.; Huckins, J. N. (Dep. Biol., Montana State Univ., Bozeman, MT 59717) **Fate of Kepone and mirex in a model aquatic environment: sediment, fish, and diet.** *Can. J. Fish. Aquat. Sci.* 38(8): 931-938; 1981 (35 references).

Laboratory studies of freshwater sediment and a daphnid-bluegill (*Daphnia magna-Lepomis macrochirus*) food chain indicated that the organochlorine insecticides Kepone (chlordecone) and mirex resist microbial degradation, accumulate and resist metabolism in fish, and move through a food chain. We found no direct evidence of degradation of either compound after 50 days of incubation in freshwater sediments under aerobic or anaerobic conditions. Furthermore, we found no metabolism or co-metabolism of ^{14}C-labeled Kepone in sediments that had long-term preexposure to Kepone and by-products nor did we detect a selective process occurring in the sediments that changed the capacity of the autochthonous microbiota to metabolize Kepone. After 28 days of exposure to ^{14}C-labeled Kepone or mirex in water and natural food, bluegills accumulated Kepone and mirex equal to 10,606 and 12,274 times the respective exposure concentrations. Elimination patterns were dissimilar: mirex tended to persist in fish tissue but Kepone did not. Neither Kepone nor mirex was metabolized by bluegills. Retention of mirex introduced into bluegills by daphnids was about 3 times greater than that of Kepone. Accumulation of Kepone and mirex by bluegills was about half that of DDT. (Author abstract by permission)

81-3395. Yoo, J. Y.; Muir, D. C. G.; Baker, B. E. (Dep. Environ. Biol., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Persistence and movement of cyanazine and procyazine in soil under field conditions.** *Can. J. Soil Sci.* 61(2): 237-242; 1981 (11 references).

The herbicides cyanazine (2-chloro-4-(1- cyano-1-methyl ethylamine)-6-ethylamino- *s*-triazine) and procyazine (2-chloro-4-cyclopropylamino-6-(1-cyano-1-methyl ethylamino)-*s*-triazine) were applied (post-emergence) to 2 corn fields that were drained by separate tile drains. Soil (0-20, 20-40, and 40-60-cm depths) and tile-drain water samples were collected before application and at frequent intervals for 6 mo following application. Cyanazine and procyazine showed similar, relatively short persistence in soil with half-lives of 6 and 13 days, respectively. The major portion (> 95%) of the residues of both herbicides was detected in the 0-20 cm depth. The herbicides were detected in tile-drain water at concentrations ranging from 2 to 111 mg/l. Overall losses of cyanazine and procyazine residues via tile-drain water represented < 0.01% of the quantity applied. (Author abstract by permission)

81-3396. Hogue, E. J.; Khan, S. U.; Gaunce, A. (Res. Stn., Agric. Canada, Summerland, British Columbia V0H 1Z0, Canada) **Leaching of four orchard herbicides in soil columns.** *Can. J. Soil Sci.* 61(2): 401-407; 1981 (16 references).

The mobility of 4 residual orchard herbicides, diuron, dichlobenil, simazine and terbacil was compared in soil columns using a sandy loam and loam soil common to the Okanagan Valley. Mobility for all herbicides was greater in the sandy loam than loam soil. Dichlobenil was least mobile in the soil columns followed by diuron, simazine then terbacil. No dichlobenil was leached through the 304 cm sandy loam soil column with 120 cm of water

but 40 cm of water leached more than half of the terbacil. More dichlobenil was converted to the water-soluble 2,6-dichlorobenzamide in the loam soil than in the sandy soil. This metabolite is water-soluble and was partially leached through the loam soil column with the highest level of irrigation. (Author abstract by permission)

81-3397. Zitko, V.; McLeese, D. W. (Fish. & Environ. Sci. Dep., Fish. & Oceans Biol. Stn., St. Andrews, New Brunswick, Canada) **Evaluation of hazards of pesticides used in forest spraying to the aquatic environment.** *Can. Tech. Rep. Fish. Aquat. Sci.* 985: 21 pp.; 1980 (38 references).

The hazards of forest spraying with pesticides to the aquatic environment were examined using both a 6-compartment equilibrium model and a 3-compartment kinetic model. These models are based on physicochemical properties and typical application rates of pesticides. Pesticides and formulation ingredients were ranked in increasing order of hazard to the aquatic environment: naphthalene < methylnaphthalene < trimethylnaphthalene < dodecane < aminocarb < dimethylnapthalene < nonylphenol < carbaryl < fenitrothion < methyl parathion < trichlorfon < phosphamidon < permethrin < chlorpyrifos < chlorpyrifos methyl < DDT < endrin. Nonylphenol was the most hazardous of the nonpesticidal ingredients. Carbaryl, methyl parathion, and trichlorfon are rated about as hazardous as fenitrothion. Endrin showed the highest hazard potential, and has never been proposed for forest spraying operations. The kinetic study revealed that for compounds with high solubility in water, residue levels were highest in water, intermediate in sediment, and lowest in air. For less persistent compounds, concentration in water decreases following a maximum reached ~ 1 day after application. For compounds with very low water solubility the concentration in water peaks around 0.5 to 1.0 days, and the concentration in sediment levels off at about the same time.

81-3398. Karickhoff, S. W. (Environ. Res. Lab., US EPA, Athens, GA 30613) **Semi-empirical estimation of sorption of hydrophobic pollutants on natural sediments and soils.** *Chemosphere* 10(8): 833-846; 1981 (41 references).

A method for estimating the equilibrium sorption behavior of hydrophobic pollutants was developed by combining thermodynamic theory and empirical correlation. The behavior predicted by the mathematical formulation was confirmed using experimental data, including data from the literature on organochlorine, organophosphorus, and carbamate pesticides. Topics of discussion include dependence of the partition coefficient on soil and sediment properties, estimation of K_{ow}, (partition coefficient/fraction organic carbon) and comparison of computed K_{ow} values with measured K_{ow} values reported in the literature. In general, the predictive equations estimated K_{ow} within a factor of 2.

81-3399. Pyysalo, H.; Wickstrom, K.; Litmanen, R. (Food Res. Lab., Tech. Res. Cent. Finland, SF-02150 Espoo 15, Finland) **Contents of chlordane-, PCB- and DDT-compounds and the biotransformation capacity of fishes in the lake area of eastern Finland.** *Chemosphere* 10(8): 865-876; 1981 (26 references).

Fish collected from locally unpolluted lakes in eastern Finland were analyzed by GLC-MS for chlordane compounds, PCBs, and DDT. The fish collected were mature vendace, perch, and roach and immature rainbow trout. Muscle and liver tissues were analyzed. None of the samples contained lindane, dieldrin, aldrin, or endrin. However, chlordane, PCB, and DDT were found. Mean levels of ΣDDT, ΣPCB, and Σchlordane in muscle were (respectively) 333, 814, and 102 ppb for perch; 62, 544, and 680 ppb for vendace; 21, 176, and 42 ppb for roach; and 19, 180, and ND for trout. Mean levels of ΣDDT, ΣPCB, and Σchlordane in liver were (respectively) 95, 437, and 209 ppb for perch; 116, 1377, and 353 ppb for vendace; 273, 937, and 151 ppb for roach; and 15, 838, and ND for trout. Hepatic levels of biotransformation enzymes were also determined for the 4 species of fish. Rainbow trout showed the highest levels of these enzymes, and also contained no chlordane compounds.

81-3400. Buchert, H.; Bihler, S.; Schott, P.; Roeper, H. P.; Pachur, H. J.; Ballschmiter, K. (Abt. Anal. Chem., Univ. Ulm, D-7900 Ulm, BRD) **Organochlorine pollutant analysis of contaminated and uncontaminated lake sediments by high resolution gas chromatography.** *Chemosphere* 10(8): 945-956; 1981 (16 references).

The analysis by high resolution gas chromatography and the use of selected lake sediments to describe the general xenobiotic output of highly industrialized urban areas are described. Samples from the upper 40-60 cm of lake sediments were taken by a freezing technique, which results in cores of nearly undisturbed layering. A soxhlet technique was used to extract the samples prior to the chromatographic determination. Typical chromatograms are presented and identified, and quantified compounds are summarized. Among 11 samples collected from various levels of 6 different lakes, DDT ranged from 0.02 to 188 μg/kg dry wt. Hexachlorobenzene, α-HCH (α-BHC), and γ-HCH (lindane) residues ranged from 0.02 to 15, 0.7 to 316, and 0.03 to 156 μg/kg dry wt, respectively.

81-3401. Fournier, J. C.; Codaccioni, P.; Soulas, G. (Lab. Microbiol. Sols, Inst. Natl. Rech. Argron., F-21034 Dijon, France) **Soil adaptation to 2,4-D degradation in**

relation to the application rates and the metabolic behaviour of the degrading microflora. *Chemosphere* 10(8): 977-984; 1981 (17 references).

Several aspects of 2,4-D degradation in soil are examined. ^{14}C-2,4-D was added to soil samples at a rate of 0.33-333 mg/kg soil. Samples were incubated at 20°C for up to 123 days. The $^{14}CO_2$ released was trapped in sodium hydroxide solution and measured by scintillation counting. An examination of degradation kinetics shows that degradation rates are greatly dependent on the 2,4-D concentration added, with higher degradation rates at the lower doses. Microorganisms in the soil extracts capable of degrading ^{14}C-2,4-D were also counted by measuring the residual radioactivity in the medium after incubation. The number of 2,4-D-metabolizing organisms was found to increase with the 2,4-D dose; the number of cometabolizing organisms was not related to pesticide dose.

81-3402. Wood, G. W. (Res. Stn., Agric. Canada, Fredericton, New Brunswick, Canada) **Monitoring of insecticide drift from forest spray operations and its effect on lowbush blueberry in New Brunswick in 1980.** *Environ. New Brunswick Rep.* 25 pp.; 1980 (5 references).

After the 1980 budworm spray proposal was released by Forest Protection Ltd., 7 blueberry fields were identified as the most vulnerable to insecticide drift from the operation. Each field was visited and the owners advised of the intent to monitor for spray drift and pollinator activity. One field was later removed from the study. Insecticide drift in fields 3, 4, 5, and 6 was determined from an air sample taken during a period of at least 2 hr immediately after aerial spraying of the nearest block of forest. Fenitrothion residues were extracted from the XAD2 resin in 2 steps, first by a hexane acetone solvent, and secondly by acetone. There was no evidence of any harmful effects on the production of lowbush blueberry as a result of the spray program. No significant drift of insecticide from the sprayed blocks was noted. In no case did the amount of fenitrothion exceed 0.05 μg/m³ air. The concentration of fenitrothion aerosols found in these fields during the 1980 program are considered below toxic levels for all bee species. Estimates of blueberry fruit set in the 4 fields monitored in 1980 are within the normal range for this area and do not suggest any harmful effect from the budworm spray program.

81-3403. Mallet, V. N. (Chem. Dept., Univ. Moncton, Moncton, New Brunswick, Canada) **A chemical residue survey in relation to the 1980 spruce budworm spray program in New Brunswick - a pilot project.** *Environ. New Brunswick Rep.* No. 80-CP-18: 55 pp.; 1980 (6 references).

Analyses were made for fenitrothion residues in a total of 465 water and air samples taken in relation to the 1980 spruce budworm spray program conducted in New Brunswick. Samples of water were taken from the Nipisiguit River near Bathurst and in 2 brooks which feed the Nipisiguit River. A small beaver pond, the Canaan River, 2 brooks feeding this river, and the Turtle Creek Reservoir of the City of Moncton, were also sampled. Air was sampled at 3 sites: the Sevogle Airstrip, the intersection of Route 430 and the Nipisiguit River, and on the campus at the Universite de Moncton. The maximum amount of fenitrothion detected in water was 20.0 ppb. Persistence was limited to a few days, except in the beaver pond, where fenitrothion was detected for 18 consecutive days. Aminofenitrothion was also detected, with a maximum concentration of 8.0 ppb detected. Fenitrothion was occasionally detected in air; the maximum concentration found was 1.2 ng/dm³. Aminofenitrothion was present in several air samples at a maximum of 12.0 ng/dm³. Contamination was considered to be low in sprayed areas and practically non-existent in non target areas.

81-3404. Norstom, R. J.; Hallett, D. J.; Onuska, F. I.; Comba, M. E. (Wildl. Toxicol. Div., Natl. Wildl. Res. Cent., Dep. Environ., Ottawa, Ontario K1A OE7, Canada) **Mirex and its degradation products in Great Lakes herring gulls.** *Environ. Sci. Technol.* 14(7): 860-866; 1980 (26 references).

Nitrated extracts of herring gull eggs from 7 Lake Ontario colonies in 1977 were analyzed by glass capillary gas chromatography/mass spectrometry. Five minor mirex-related compounds were found in addition to mirex and the previously identified 8-monohydromirex (photomirex). The levels (mg/kg wet wt ± standard deviation) of all 7 compounds were determined by high-resolution gas chromatography: 2,8-dihydromirex (0.016 ± 0.005); $C_{10}Cl_{10}H_2$ (II), possibly 3,8-dihydromirex (0.011 ± 0.003); 8-monohydromirex (0.95 ± 0.14); $C_{10}Cl_{11}H$ (III), possibly 9-monohydromirex (0.077 ± 0.14); 10-monohydromirex (0.199 ± 0.025); mirex (2.58 ± 0.40); and $C_{10}Cl_{12}$ (II) consistent with an isomer of mirex (0.039 ± 0.011). It was concluded that photodegradation was the only feasible mechanism for formation of these compounds, but that mirex and its photoproducts rapidly became sequestered in the ecosystem and protected from further degradation. (Author abstract by permission)

81-3405. Huggett, R. J.; Bender, M. E. (Virginia Inst. Mar. Sci., Gloucester Point, VA 23062) **Kepone in the James River.** *Environ. Sci. Technol.* 14(8): 918-923; 1980 (16 references).

Kepone (chlordecone) contamination of the James River from pesticide plant operations at Hopewell, Virginia was first investigated in July of 1975, when a plant worker showing signs of neurological illness was found to have high Kepone levels in his blood. To protect public health the James River and its tributaries were closed to fishing and shellfish harvest. Only after studies were conducted to determine the abilities of oysters to purge themselves of the

chemical while living in clean waters, was the harvesting of seed oysters in the James River permitted. Acceptable concentration levels for fish were set. Numerous studies were begun to determine Kepone's effects on biota of the area. Fish, birds, and mice have been found to contain Kepone. The bottom sediments of the James River act as a reservoir for the toxicant; when the sediment is disturbed, the Kepone cycles into solution, is taken up by plants and animals, and is returned to the sediments upon death of the organisms. Benthic animals may take up Kepone directly from the sediments and pass it on to their predators. The area of the James River where Kepone is detectable is 500 km^2. Kepone is found in highest concentrations during slack tides, when suspended sediment levels are highest. When currents bring in increasing amounts of mineral grains, Kepone levels are lowest.

81-3406. Reichardt, P. B.; Chadwick, B. L.; Cole, M. A.; Robertson, B. R.; Button, D. K. (Inst. Mar. Sci., Univ. Alaska, Fairbanks, AK 99701) **Kinetic study of the biodegradation of biphenyl and its monochlorinated analogues by a mixed marine microbial community.** *Environ. Sci. Technol.* 15(1): 75-78; 1981 (24 references).

The first comparative biodegradation rates of biphenyl (BP) and chlorobiphenyls (ClBP) by microbial communities in seawater is presented. Rates were in the order BP> 2-ClBP > 4-ClBP > 3-ClBP. The total observed range in these relative rates was only a factor of 3.7. The turnover time of monochlorobiphenyls in an Alaskan estuary is estimated to be on the order of 1 yr at a concentration of 0.1 μg/l or less with longer turnover times probable at higher concentrations. No significant buildup of partially degraded products was observed. (Author abstract reprinted by permission of the American Chemical Society)

81-3407. Erb, F.; Dequidt, J.; Pommery, J.; Colein, P. (Lab. Hydrol. & Toxicol., Fac. Pharm., F-59045 Lillie Cedex, France) **Evolution de quelques herbicides chlores et azotes dans une chaine trophodynamique en eau douce. [Evolution of some chlorine and nitrogen herbicides in a freshwater trophodynamic chain.]** *Environ. Technol. Lett.* 1(1): 58-63; 1980 (8 references) (French).

The long-term fixation of herbicides that decompose rapidly in water and soil, and thus possess low toxicity, was investigated in freshwater crustacean food chain organisms. The chlorinated herbicides 2,4-D and chlorpropham (CIPC), and the nitrogen-containing herbicides monuron and atrazine, were used. The study was performed on an experimental model previously used in a study involving PCBs. Pesticide concentrations were 50-100 ppb. Algae accumulated 3-8 ppm of pesticides after 2-3 wk; beyond this time the culture degenerated. In *Daphnia*, 2,4-D and CIPC were found in ppm quantities; atrazine and monuron were not detected. In fish 2,4-D and CIPC accumulation reached 5-7 ppm in 10 to 12 wk; atrazine and monuron were detected only at 100 to 200 ppb levels. Monuron and atrazine, more easily degraded and metabolized, present much less of a hazard to human health than 2,4-D and CIPC.

81-3408. Finoli, C. (Ist. Ind. Agrar., Cattedra Residui & Addit. Aliment., Univ. Milano, Milan, Italy) **Residui di antiparassitari clorurati organici in yogurt e dessert a base di latte. [Chlorinated pesticide residues in yogurts and milk desserts.]** *Illatte* 5(5): 321-323; 1980 (8 references) (Italian).

Three samples of commercial yogurt, 20 samples of fruit and honey yogurt, and 14 samples of milk base dessert were analyzed for the presence of chlorinated pesticide residues. The contaminants were present in the samples within a range of 0-66 ng/g; 2 fruit yogurts and 1 dessert were free of contamination. Aldrin, dieldrin, *o,p'*-DDT and *p,p'*-DDT were not detected. Heptachlor epoxide was present in 1 sample at 3 ng/g. Heptachlor was found in 19 samples. The most widespread contaminant was α-BHC; in 1 yogurt sample 5 ng/g were detected. DDT compounds were found in 16 of the 37 samples. Contamination with chlorinated pesticides, whose use has been banned for several years, was found to be declining, with the exception of heptachlor. The high incidence of heptachlor detection in the samples is unexplained.

81-3409. Archer, T. E.; Stokes, J. D. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Residue analysis of β-naphthoxyacetic acid and β-napthol on field-sprayed tomatoes by high-pressure liquid chromatography.** *J. Agric. Food Chem.* 28(4): 877-879; 1980 (4 references).

Experiments were performed to determine the levels and fate of β-naphthoxyacetic acid (BNOA) and its postulated metabolite (β-naphthol; 2-napthol) on tomato flowers, fruit, and leaves when a wettable powder formulation of 42 and 84 ppm AI BNOA in water was sprayed on the tomato plant blossoms in the field, not taking care to avoid leaves and fruit. Residues of BNOA dropped to negligible levels 5-10 days after application and non β-naphthol residues were detected (< 0.01 ppm). Even after 3 spray applications at 10-day intervals, no residue buildup was detected on the plant parts. The tomato leaves retained the BNOA for the longest period of time. However, 5-10 days after application, no significant residues remained on the leaves. Similar results were obtained when the entire plant was intentionally sprayed with BNOA. The harvest fruit in all experiments contained < 0.01 ppm of BNOA and β-naphthol. (Author abstract reprinted by permission of the American Chemical Society)

81-3410. Castro, C. E.; Belser, N. O. (Dep. Nematol., Univ. California, Riverside, CA 92521) **Photohydrolysis of**

methyl bromide and chloropicrin. *J. Agric. Food Chem.* 29(5): 1005-1008; 1981 (15 references).

The rate of hydrolysis of methyl bromide and chloropicrin can be markedly enhanced by light. An ~ 7-fold increase in the rate for methyl bromide results from irradiation with a small pen-ray UV lamp ($k\lambda = 2.0 \times 10^{-6} s^{-1}$). At least 99.6% of the reaction proceeds quantitatively to methanol, bromide ion, and protons. A trace of methane (<0.4%) is produced. The lack of any significant oxidation product of methanol or bromide ion along with the very small yield of methane is interpreted to indicate the reaction is the result of the direct hydrolysis of photoexcited methyl bromide. Chloropicrin is decomposed even more rapidly by light ($k\lambda = 1.4 \times 10^{-4} s^{-1}$). In neutral aqueous solution without irradiation, no hydrolysis is detected in 10 days. With irradiation, a 10^{-3} *M* solution is dissipated in hours. The products of the aqueous photo reaction in air are carbon dioxide, chloride ion, nitrate ion, and protons. Nitrite ion can be detected in small amounts (~2-3%) when the reaction is conducted under argon. The nitrite to nitrate conversion is not fast enough to accommodate the kinetics under aerobic conditions. (Author abstract reprinted by permission at the American Chemical Society)

81-3411. Briggs, G. G. (Rothamsted Exp. Stn., Harpenden, Herts AL5 2JQ, England) **Theoretical and experimental relationships between soil adsorption, octanol-water partition coefficients, water solubilities, bioconcentration factors, and the parachor.** *J. Agric. Food Chem.* 29(5): 1050-1059; 1981 (51 references).

It is shown how approximate values of the constants in the Collander equation, $\log K_1 = a \log K_2 + b$, where K_1 and K_2 are organic solvent-water partition coefficients, can be calculated knowing only the water concentration in the 2 organic solvents. When this is used, equations are derived relating adsorption on soil organic matter, octanol-water partition coefficients, water solubility, and bioconcentration factors. The derived equations are closely similar to regression equations from experimental results. Measurement or calculation of 1 property allows prediction of the other properties to within 1 order of magnitude. Water solubility of organic solids requires a correction for the melting point for good prediction of other properties. Relationships to the parachor are also demonstrated which allow a good preliminary assessment of the environmental partitioning properties of a compound from its chemical structure and melting point. Values for numerous pesticides are presented in tabular form. (Author abstract reprinted by permission of the American Chemical Society, modified)

81-3412. Grover, R.; Kerr, L. A.; Khan, S. U. (Res. Stn., Agric. Canada, Regina, Saskatchewan S4P 3A2, Canada) **Multidetector gas chromatographic determination and confirmation of airborne triallate residues in Saskatchewan.** *J. Agric. Food Chem.* 29(5): 1082-1084; 1981 (13 references).

Accumulative triallate samples were collected daily from May to November in the cereal growing region of southern Saskatchewan by using an air sampling train with polyurethane foam as the adsorbent material. A cleanup procedure was developed to improve the analysis of extracted triallate by gas chromatography, using an electron capture (EC) detector and an alkali flame ionization detector (AFID). The limit of detection of airborne triallate was set at 0.5 ng/m³ (12.7 ng/m³ = 1 part per trillon triallate in the air). The maximum concentrations of triallate were found during the peak spraying season in May, being up to 200 ng/m³ in 1978 and 100 ng/m³ in 1979. The triallate concentrations in the air gradually decreased to 20 ng/m³ or less by midsummer, with some increase again in the fall, corresponding to the limited fall application of the chemical. After freeze up of the soil in early November, the triallate levels in the air fell below the detection limit. In general, the dramatic increases in triallate concentrations in the air during summer usually followed a rainfall event. (Author abstract reprinted by permission of the American Chemical Society)

81-3413. Cline, S.; Felost, A.; Wei, L. (Sect. Econ. Entomol., Illinois Nat. Hist. Surv., Champaign, IL 61820) **Determination of methyl 2-benzimidazolylcarbamate in black walnut fruit.** *J. Agric. Food Chem.* 29(5): 1087-1088; 1981 (15 references).

An analytical method for determining the systemic fungicidal compound methyl 2-benzimidazolylcarbamate (MBC; carbendazim) was developed for black walnut fruit by using a modified gas chromatographic procedure. Black walnut (*Juglans nigra* L.) trees were treated by soil injection or foliar sprays with benomyl (Benlate 50WP) or trunk infused with Lignasan BLP (Correx). Analysis of MBC residue in walnut fruit collected in August and September during 1 growing season determined low concentrations (≤ 0.30 ppm) present in all treatments. Only the August collection contained residue above the minimum detectable quantity (MDQ) of 0.010 ppm. The present allowable tolerance of MBC on or in black walnut fruit is designated at 0.13 ppm. (Author abstract reprinted by permission of the American Chemical Society)

81-3414. Wheeler, W. B.; Thompson, N. P.; Edelstein, R. L.; Krause, R. T. (Pestic. Res. Lab., Univ. Florida, Gainesville, FL 32611) **Degradation of methomyl residues in frozen strawberries.** *J. Assoc. Off. Anal. Chem.* 64(5): 1211-1215; 1981 (4 references).

^{14}C-Methomyl suspended in a commercial formulation was sprayed on strawberries. At 7 and 14 days post-application, mature berries were harvested and chopped. Fresh chopped berries were extracted with methanol using a Polytron homogenizer, and the crop marc was

subsequently leached with methanol, freeze-dried, and re-extracted. Portions of the fresh chopped fruit were also frozen at −20°C for 1, 30, and 120 days before extraction with methanol using a Polytron homogenizer, followed by subsequent leaching of the crop marc. For fresh berries 93.7 and 88.9% of the ^{14}C present at harvest was extractable at 7 and 14 days post-application, respectively. Based on thin layer chromatographic analysis, methomyl represented 83.5 and 68.2% of the ^{14}C extracted from fresh berries at 7 and 14 days, respectively. Freezing of strawberries reduced extraction efficiency and appeared to degrade methomyl. At 7 and 14 days post-application, averages of 80.9 and 77.1%, respectively, of the ^{14}C present were extractable after frozen storage regardless of storage time. Furthermore, only about 10% of the extracted ^{14}C was methomyl; the remainder was of unknown composition. (Author abstract by permission)

81-3415. Hansen, L. B.; Castillo, G. D.; Biehl, E. R. (FDA, Dallas, TX 75204) **Gas chromatographic-mass spectrometric characterization of an alteration product of malathion detected in stored rice.** *J. Assoc. Off. Anal. Chem.* 64(5): 1232-1237; 1981 (8 references).

Four alteration products of malathion have been observed in crop extracts of rice, which may not be readily identifiable in a typical gas chromatographic-mass spectrometric (GC-MS) analysis of the residues. Extracts of rice containing malathion and several related compounds were analyzed on gas-liquid chromatographic (GLC) columns of different polarities. The methyl ether succinate ester of malathion co-elutes with malaoxon from a nonpolar GLC column. Retention data and GC-MS analysis indicate the presence of 3 previously reported compounds. Evidence was obtained for a fourth compound, *O*-methyl *O*-ethyl *S*-(1,2-bis-carbethoxy) ethyl phosphorodithioate, apparently resulting from the environmental alteration of malathion. (Author abstract by permission)

81-3416. Rains, D. M.; Holder, J. W. (Chem. & Biol. Invest. Branch, US EPA, Beltsville, MD 20705) **Ethylene dibromide residues in biscuits and commercial flour.** *J. Assoc. Off. Anal. Chem.* 64(5): 1252-1254; 1981 (10 references).

Flour and biscuit samples from a school lunch program were analyzed for ethylene dibromide (EDB). Flour samples were extracted with hexane at room temperature with maximum extraction of EDB in 4 days. Biscuits were extracted by steam distillation with hexane; optimum recoveries were obtained by a triple extraction of the sample. Recoveries of EDB from flour and biscuits ranged from 85 to 103% as determined by gas-liquid chromatography on a 15% OV-17 column and a ^{63}Ni electron capture detector. Random samples were confirmed by gas chromatography-mass spectrometry. From < 8 ppb to 4 ppm EDB were determined in flour and < 0.5 ppb to 260 ppb in biscuits. Possible sources for the higher values are discussed. (Author abstract by permission)

81-3417. Hatfull, R. S. (Cty. Anal. Dep., Stafford ST16 2LC, England) **Survey of fungicide (thiocarbamate) residues in lettuce. A report on behalf of the Association of Public Analysts.** *J. Assoc. Public Anal.* 18(3): 73-76; 1980 (4 references).

Following the publication of 2 previous reports in 1976 and 1977, the Association of Public Analysts published a 3rd report on the amount of fungicides contained in lettuces in the United Kingdom. The survey, conducted upon the request of the Ministry of Agriculture of England, showed that for all of 1979, 16.7% of the lettuce crop contained significant amounts of thiocarbamate fungicide residues. During the period from the beginning of May to the end of September, only 7.4% of the lettuces contained significant levels of thiocarbamate fungicide residues. These figures were lower than those reported in the 2 previous studies.

81-3418. Schroeder, M. H.; Sturges, D. L. (Denver Wildl. Res. Cent., US Fish & Wildl. Serv., Denver, CO) **Spraying of big sagebrush with 2,4-D causes negligible stream contamination.** *J. Range Manage.* 33(4): 311-312; 1980 (2 references).

Residue levels of 2,4-D were measured in stream waters at locations adjacent to treated and untreated big sagebrush watersheds. The experimental site was on the Stratton sagebrush hydrology study area 9 km west of Saratoga, Wyoming, at an elevation of 2225 m. The treated watershed, Sane Creek, is a 238-ha drainage. Loco Creek, 663 ha, is an adjacent untreated watershed. Sane Creek was sprayed at an average application rate of 2.2 kg acid-equivalent of 2,4-D/ha. Four 1-liter water samples were taken for analysis of 2,4-D. Water was collected from 0 to 10 cm depth at mid-stream. Samples were collected 3, 6, and 12 hr, and 1, 2, 3, and 9 days after spraying. Sane Creek samples collected before spraying contained < 1 ppb 2,4-D. The maximum concentration in stream water after treatment was 5 ppb at 3-12 hr after treatment. At 1, 2, and 3 days after treatment, 2 ppb of herbicide residue was detected. Herbicide levels in the surface centimeter of snow collected within the unsprayed buffer area ranged from 17 to 59 ppb, with an average of 35 ppb. These findings suggest that the buffer zone of unsprayed sagebrush was effective in reducing the amount of herbicide reaching the stream. Only 2 ppb 2,4-D were found in Loco Creek.

81-3419. Demdnko, V. I.; Yaroslavtsey, E. I. (NIZI Hortic. Nonchernozem Zone, USSR) **Ostatochnye kolichestva al'fa-naftiluksusnoi kisloty v plodakh maliny i chernoi smorodiny. [Residual quantities of alpha-**

naphthylacetic acid in raspberry and black currant fruit.] *Khim. Sel'sk. Khoz.* 19(7): 50-51; 1981 (8 references) (Russian).

Residual quantities of α-naphthylacetic acid (NAA) were determined in fruit and leaves of raspberry and black currant as a function of the date and number of treatments on the experimental plots. NAA residues in black currant fruit after a single treatment did not exceed residues after 2 treatments, but were significantly greater than in raspberries. NAA residues were detected in raspberries of the Latam cultivar both in the year of treatment and in the following year. With annual treatments of black currant plants, NAA did not accumulate in fruit. NAA residues were not detected in raspberries of the cultivars Novost' Kuz'mina and Glen Kloya after a single treatment.

81-3420. Lombai, J.; Nagy, E. (Cent. Lab., Natl. Feed & Anim. Health Insp., H-1051 Budapest, Hungary) **Import es hazai husliszték DDT szennyezettsege 1978-ban. [DDT contamination of imported and domestic meat meals in 1978.]** *Magy. Allatorv. Lapja* 35(8): 519-522; 1980 (1 reference) (Hungarian).

A total of 422 meat meal samples from lots imported from Italy (366 samples), France (10), Denmark (5), and produced in Hungary (41) in 1978 were analyzed for DDT levels. The DDT levels exceeded 50 μg/kg in 7.6% of the Italian, 7.3% of the Hungarian, and 0% of the French samples. The average DDT levels were 0.048 mg/kg in the Italian samples, 0.011 mg/kg in the French samples, and 0.023 mg/kg in the Hungarian samples. The average maximum levels were 0.273 mg/kg in the Italian samples, 0.024 mg/kg in the French samples, and 0.193 mg/kg in the Hungarian samples. The findings indicate that in view of the low percentage at which the meat meals are mixed to feed mixes (2.5-2.7%, maximum) there can be no accumulation of DDT in the trophic chain. It is recommended that meat meal from lots with higher contamination levels should be diluted.

81-3421. Winchester, R. V.; Keating, D. L. (Chem. Div., Dep. Sci. & Ind. Res., Petone, New Zealand) **Trade metal and organochlorine pesticide residues in New Zealand farmed oysters: a preliminary survey.** *N. Z. J. Sci.* 23(2): 161-169; 1980 (32 references).

Organochlorine (OCl) pesticide residues were measured in oysters gathered from farms and from wild beds off the New Zealand coast. Gas chromatography was used following cleanup on a Florisil column. Because of the absence of dieldrin and TDE isomers in initial studies, analysis for these compounds was omitted. Samples taken near Waiheke Island were also screened for aldrin. *p,p'*-DDE was detected at concentrations of 0.003 μg/g in 1 sample, 0.004 μg/g in 3 samples, and 0.005 μg/g in 2 samples. Faint traces of lindane were found in 2 samples. The detection limit for aldrin was 0.0002 μg/g; no residues were found. There was no significant level of pesticide pollution in the areas tested.

81-3422. Kodama, T.; Kuwatsuka, S. (Aichi Environ. Res. Cent., Kita, Nagoya, Aichi 462, Japan) **[Factors for the persistence of parathion, methyl parathion, and fenitrothion in sea water.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(3): 351-355; 1980 (25 references) (Japanese).

An experimental planning method using an L-16 (2-15) orthogonal layout was used to measure the persistence of parathion, methyl parathion, and fenitrothion in sea water. Five parameters and 2 levels were used for statistically determining the factor for persistence. Water quality, suspended solids, temperature, light, and vaporization of the chemicals were the 5 parameters used. The persistence of organophosphorus insecticides in the water environment was affected mostly by water quality and light and partially by temperature, but not by suspended solids and vaporization. Even in sea water at pH 8.3 the phosphorus insecticides were chemically stable. The high salt concentration in the sea water significantly depressed the microbial degradation of the insecticides. The residual amount of fenitrothion in sea water sampled near an air-sprayed area was higher than that in river water.

81-3423. Yumita, T.; Yamamoto, I. (Chem. Res. Inst., Kumiai Chem. Co. Ltd., Shimizu, Shizuoka 424, Japan) **Degradation of mepronil (Basitac) in soils under submerged conditions in the laboratory.** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(3): 363-369; 1980 (9 references).

The fungicide mepronil, uniformly labeled with ^{14}C at the aniline-ring, was applied to samples of volcanic ash soil (Aso) (mineral soil with allophane clay mineral) and Kikugawa soil (mineral soil with kaoline clay mineral). Mepronil is usually applied at the rate of 4 kg of 3% dust/10 acres (4 ha) in paddy fields. Mepronil at 1.6 ppm on a dry soil basis was applied in drops on the submerged soils in a biometric flask and thoroughly mixed. The radioactive residue in the 2 types of soil was separated into extractable and bound residue fractions. In both soils, the extractable fraction gradually decreased during incubation, reaching 40% after 80 days. Most of the radioactivity was due to mepronil, while the total degradation product was < 8.1% in Aso soil at 40 days, and 9.3% in Kikugawa soil after 80 days. The half-life of mepronil is estimated as 46 days in Aso soil and 50.5 days in Kikugawa soil. From the chemical structure of the degradation products, mepronil seems to be hydroxylated at 3 positions. All of the products, along with mepronil, are adsorbed on to soil particles.

81-3424. Yamaguchi, I. (Fungic. Lab., Inst. Phys. & Chem. Res., Wako, Saitama 351, Japan) **[Studies on the**

fate of Blasticidin S and methoxyphenone in the environment.] *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(3): 441-451; 1980 (27 references) (Japanese).

A model system was used to study the behavior and metabolism of Blasticidin S and methoxyphenone in the environment. After foliar application of Blasticidin S, most of the antibiotic remained on the surface of the rice plant. At the point of a wound or infection, however, Blasticidin S was taken up by the plant and translocated mainly to the upper part. Sunlight decomposed the compound, which remained on the leaf surface, producing cytosine as the main degradation product. Blasticidin S was metabolized only gradually in the plant, with the formation of a small amount of cytomycin and traces of other compounds. Blasticidin S on the ground was tightly bound to the soil surface. From soil treated with the chemical, a significant liberation of carbon dioxide was noted. Several microbes usually inhabiting the paddy field lowered the biological activity of Blasticidin S. A fungal strain, identified as *Aspergillus terreus*, caused marked inactivation by converting the antibiotic to deaminohydroxy-derivatives. Treated plants, soil and rats rapidly metabolized methoxyphenone. An isolated bacterium of the *Bacillus* sp. was able to degrade methoxyphenone and showed a remarkable activity to phosphorylate phenolic OH of the desmethylated metabolite.

81-3425. Springer, M. A. (Dep. Anat., Wright State Univ., Dayton, OH 45435) Pesticide analysis, egg and eggshell characteristics of red-tailed hawk eggs. *Ohio J. Sci.* 80(5): 206-210; 1980 (18 references).

Seventy addled red-tailed hawk eggs representing 63 clutches were randomly collected in 6 Ohio counties and 3 counties in Kentucky. Egg samples analyzed for pesticide residues contained measurable amounts of PCB and DDE. Of 15 samples, 13 contained dieldrin and 12 contained heptachlor. Of the 15 samples analyzed, PCB was the most abundant residue in 13; dieldrin was the most abundant residue in 2 samples. Over a 3 yr period the residues of DDT and metabolites dieldrin and PCB decreased, while heptachlor levels remained relatively constant. Addled eggs had significantly higher pesticide levels than viable eggs. It is suggested that the pesticide levels may have resulted in the structural differences found between addled and viable eggs.

81-3426. Adhya, T. K.; Subhakar-Barik; Sethunathan, N. (Lab. Soil Microbiol., Div. Soil Sci. & Microbiol., Central Rice Res. Inst., Cuttack 753006, India) Fate of fenitrothion, methyl parathion, and parathion in anoxic sulfur-containing soil systems. *Pestic. Biochem. Physiol.* 16(1): 14-20; 1981 (11 references).

Metabolism studies were carried out on fenitrothion, methyl parathion, and parathion in acid-sulfate and low-sulfate soils under flooded conditions. Test tubes containing 5 different soils were flooded with water for 30 days prior to addition of 500 μg of insecticide. Following extraction with methanol-acetone-benzene, the residues in the soil samples were analyzed by gas-liquid chromatography. Redox potentials were measured before and after equilibration with the insecticides. In the soils reduced by flooding, the major products obtained from parathion, methyl parathion, and fenitrothion were aminoparathion, aminomethyl parathion, and aminofenitrothion, respectively. Also detected in anaerobic acid sulfate soils were desethyl aminofenitrothion. No degradation of the insecticides occurred in aerobic soils. The presence of sulfate was necessary for the occurrence of dealkylation. The ecological significance of these findings is discussed.

81-3427. Veith, G. D.; Kuehl, D. W.; Leonard, E. N.; Welch, K.; Pratt, G. (Environ. Res. Lab., US EPA, Duluth, MN 55804) Polychlorinated biphenyls and other organic chemical residues in fish from major United States watersheds near the Great Lakes, 1978. *Pestic. Monit. J.* 15(1): 1-8; 1981 (6 references).

Studies of chemical residues in fish from rivers in Minnesota, Wisconsin, Indiana, Michigan, Ohio, and New York are presented. Fish were taken from 26 sampling areas. PCBs were found in all samples in concentrations ranging from < 0.1 ppm in fish from the upper reaches of Cattaragaus Creek, New York, to 14.6 ppm in fish from the Raisin River, Michigan. Aroclor 1254 constituted over 50% of the total PCB residues found in the majority of the samples. DDT was a minor contaminant in fish in the river systems under study. Although DDE was found in all samples, ΣDDT concentration in 81% of the samples was < 1.0 ppm, with the maximum concentration being 1.66 ppm in Lake Ontario fish. HCB was the next most prevalent organochlorine found in this study, with 65% of the samples containing measurable quantities. Ashtabula River fish contained 0.447 ppm, while most levels were < 0.05 ppm. Chlordane and components of technical chlordane were found in 38% of the samples. In most cases the fish contained < 0.05 ppm chlordane, but some contained 2.57 and 2.68 ppm levels. Heptachlor and heptachlor epoxide were found only in fish from the Wabash, Ashtabula, and Huron rivers, and Lake Ontario. Oxychlordane was present in Rocky River, Lake Ontario, and Lake Erie fish at a maximum concentration of 167 ppb.

81-3428. Kaphalia, B. S.; Husain, M. M.; Seth, T. D.; Kumar, A.; Murti, C. R. K. (Ind. Toxicol. Res. Cent., Mahatma Gandhi Marg, Lucknow 226001, India) Organochlorine pesticide residues in some Indian wild birds. *Pestic. Monit. J.* 15(1): 9-13; 1981 (24 references).

Wild pigeon, crow, kite, vulture, and cattle egret (3 of each species) were obtained through commercial bird trappers during February and March of 1980 in the urban area of Lucknow, India. For comparison, chickens were

purchased from a livestock farm in Lucknow. The concentrations of BHC and DDT residues in blood plasma, brain tissue, and depot fat were determined. The amount of BHC and lindane present in blood plasma, brain tissue, and depot fat of kite and cattle egret were comparable. Relatively high levels of Σ BHC were detected in crow and pigeon brain, compared with blood plasma levels. Vultures contained 1.25 ppm Σ BHC and 0.34 ppm lindane in the brain, levels many times higher than those present in other species studied. BHC levels as high as 29.73 ppm were recorded in crow depot fat. BHC levels in liver, heart, lung, and kidney were generally high in pigeons and crows. Breast muscles and spleen of vulture and blood plasma of chicken were relatively low. Few samples of lungs, spleen, and depot fat of crow showed measureable levels of *p,p'*-DDT. *p,p'*-DDT was not detected in lung, kidney, or brain of pigeon or cattle egret. ΣDDT levels were 0.59, 20.32, 50.79, 67.10, and 95.35 ppm in depot fat of chicken, cattle egret, crow, kite, and vulture, respectively. ΣDDT levels were 0.01, 0.01, 0.04, 0.07, 0.054, and 0.51 ppm in blood plasma and 0.01, 0.02, 0.04, 0.07, 0.08, and 1.42 ppm in brain tissue of chicken, pigeon, cattle egret, crow, kite, and vulture, respectively.

81-3429. May, T. W.; McKinney, G. L. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia, MO 65201) **Cadmium, lead, mercury, arsenic, and selenium concentrations in freshwater fish, 1976-77 – National Pesticide Monitoring Program.** *Pestic. Monit. J.* 15(1): 14-38; 1981 (91 references).

As part of the National Pesticide Monitoring Program of the Fish and Wildlife Service, US Department of the Interior, collected freshwater fish during 1976-77 from 98 monitoring stations and analyzed them for residues of cadmium, lead, mercury, arsenic, and selenium. Range and geometric mean values in mg/kg wet wt follow: Cd, 0.01-1.04, 0.07; Pb, 0.10-4.92, 0.32; Hg, 0.01-0.84, 0.11; As, 0.05-2.92, 0.27; Se. 0.05-2.87, 0.56. An arbitrary 85th percentile was calculated for concentrations of each element in fish to identify monitoring stations having fish with higher-than-normal concentrations: Cd, 0.11 mg/kg; Pb, 0.44; Hg, 0.19; As, 0.38; Se, 0.82. Log-transformed mean concentrations in fish from 1976-77 monitoring stations are compared with means from the same stations in 1972 (Cd, Hg, Pb, As, Se) and 1973 (Se) to depict temporal trends in whole-body concentrations; Cd, significant decline; Pb, no significant difference; Hg, significant decline; As, significant increase; Se, no significant difference. Because of changes in laboratories and analytical procedures, these conclusions should be used cautiously as trend information. Production, consumption, and disposal of cadmium, lead, mercury, arsenic, and selenium are discussed as potential environmental sources of the elements to the aquatic environment. Specific environmental sources are suggested for monitoring stations having trace element levels exceeding calculated 85th percentiles. (Author abstract by permission)

81-3430. Johnson, R. D.; Manske, D. D.; New, D. H.; Podrebarac, D. S. (Dist. Off. Lab., US FDA, Kansas City, MO 64106) **Pesticide, heavy metal, and other chemical residues in infant and toddler total diet samples–(II)–August 1975-July 1976.** *Pestic. Monit. J.* 15(1): 39-50; 1981 (19 references).

The Food and Drug Administration, US Department of Health and Human Services, initiated the Total Diet Study in 1964 to monitor residues of pesticides and other chemicals ingested in the average diet of the United States heartiest eater, the young adult male. In August 1974, one-third of the adult market baskets were replaced with infant and toddler market baskets. Averages and ranges of residues for this second in a series of infant and toddler baskets, for August 1975-July 1976, are reported. Included are results of determinations for zinc, cadmium, lead, selenium, arsenic, mercury, and 31 pesticides (insecticides, fungicides and herbicides). Results of recovery studies conducted with compounds of each residue type are also presented. (Author abstract by permission, modified)

81-3431. Falandysz, J. (Vet. Hyg. Res. Stn., PL 80-316 Gdansk, Poland) **Organochlorine pesticides and PCBs in cod-liver oil of Baltic origin, 1971-80.** *Pestic. Monit. J.* 15(1): 51-53; 1981 (18 references).

Results of analyses of cod-liver oil from the Baltic region for residues of HCB (hexachlorobenzene), ΣDDT, and PCBs during 1971-80 are presented. Samples of the oil were taken from a factory in Gdynia, Poland. DDT and its metabolites were present in all samples. Residue levels were 1.1-24 ppm DDE, from 0.69-6.5 ppm TDE, and 0.59-0.2 ppm DDT. ΣDDT levels ranged from 3.3 to 38 ppm. ΣDDT levels declined during the 9-yr study period, but the reason for this decline is unknown. PCBs and HCB were also detected in all samples, at levels ranging from 2.2 to 16 ppm and from 0.01 to 0.54 ppm, respectively. All samples contained at least trace amounts of α-BHC and γ-BHC (lindane).

81-3432. Johnson, R. D.; Manske, D. D.; Podrebarac, D. S. (Dist. Off. Lab., US FDA, Kansas City, MO 64106) **Pesticide, metal, and other chemical residues in adult total diet samples–(XII)–August 1975-July 1976.** *Pestic. Monit. J.* 15(1): 54-69; 1981 (19 references).

This report is the twelfth in the series on the presence of pesticide and other chemical residues in the average diet of the United States heaviest eater, the young adult male. Twenty market baskets were collected in 20 US cities that ranged in population from < 50,000 to 1 million or more. Composites of 12 food classes were analyzed. Averages and ranges of residues found are reported for August 1975 through July 1976, by food class. Average residues are reported for 41 insecticides and fungicides. In addition to the pesticide and chemical residues, data for lead, cadmium, selenium, mercury, arsenic, and zinc are

included. The individual items making up the dairy and meat composites in 4 market baskets were analyzed separately for pesticide residues, and the results are included. Results of recovery studies of pesticides and chemicals within various food classes are also presented. (Author abstract by permission, modified)

81-3433. Goud, K. B.; Kulkarni, K. A.; Thontadarya, T. S. (Dep. Entomol., Coll. Agric., Dharwad 580005, India) **Residues of insecticides in safflower seed.** *Pesticides* 15(3): 12-13; 1981 (5 references).

Insecticide residues in safflower seeds that are processed into cooking oil were studied. Safflower plants (78 days old) were treated with 8 insecticides, and residues were determined in seeds. Immediately after harvest, the highest residue (0.1 ppm) was encountered with phosalone 4.0% dust. The lowest residues (0.067 ppm) were found with phosphamidon spray, malathion dust, quinalphos dust, pirimicarb 500 ppm, and pirimicarb 350 ppm sprays. Residues of 0.075, 0.082, and 0.086 ppm were recorded in seeds treated with vamidothion spray, ethiofencarb spray, and endosulfan dust. None of the insecticide residues were above the tolerance limits.

81-3434. Balasubramanian, M.; Rajukkannu, K.; Saivaraj, K.; Vasudevan, P. (Pestic. Residue Lab., Tamil Nadu Agric. Univ., Coimbatore-3, India) **Insecticide residues in gingelly.** *Pesticides* 15(3): 35; 1981 (2 references).

Insecticide residues were determined in gingelly seeds from plants sprayed on days 40 and 60 with phosalone (0.05%), fenthion (0.1%), monocrotophos (0.083%) or endosulfan (0.07%). Residues of all 4 chemicals were well below US EPA tolerance levels. Phosalone ranged from 0.60 to 1.36 ppm; fenthion from ND to 0.052 ppm; monocrotophos from ND to 0.083 ppm; and endosulfan from 0.36 to 0.42 ppm.

81-3435. Gonzalez Rodriguez-Cordoba, J. M.; Lopez Fernandez, A.; Fernandez Haeger, J.; Infante Miranda, F. (Dep. Farmacol. & Toxicol., Fac. Vet., Univ. Cordoba, Spain) **Influencia del calor sobre los residuos accidentales de insecticidas organoclorados en el niscalo (*Lactarius delicosus* L.). [The influence of heat on accidental residues of organochlorine insecticides in the mushroom (*Lactarius delicosus* L.).]** *Rev. Sanid. Hig. Publica* 53(7-8): 1081-1096; 1979 (42 references) (Spanish).

Residues of organochlorine insecticides were measured in soils and mushrooms. All soil and mushroom samples contained HCH (BHC) at an average concentration of 0.8 and 0.84 ppm, respectively. DDT was found in 84% of the samples, at 0.09 ppm in soil and 0.05 ppm in mushrooms. Dieldrin was seen in 60% of the soil samples, with an average concentration of 0.008 ppm. Concentration factors were 1.05 for the HCHs, 0.4 for dieldrin, and 0.52 for DDT.

81-3436. Leung, S.; Peter, R.; Reed, W.; Johnson, R.; Ling, T. (Eureka Lab. Inc., Sacramento, CA) **Air pollution emissions associated with non-synthetic hydrocarbon in California. Volume II. Final report.** *US NTIS PB Rep* PB81-157,729: II: 300 pp.; 1980 (11 references).

This report presents the results of a survey of the use of nonsynthetic hydrocarbon (NSHC) pesticides in California during 1977 and the associated volatile organic compound emissions. An estimated 225.2 million lb of NSHC pesticide products were used in California during 1977 resulting in an average of 249.3 tons of organic emissions/day. Weed oils accounted for the majority of NSHC applied (68.2%) with the remainder distributed among insecticides (14.5%), wood preservatives (11.8%), defoliants (2.1%) and minor inert ingredients (3.5%). Periods of peak emissions occurred during January and April through September. Dormant season control of insects in deciduous fruit trees and weeds in alfalfa account for the emissions during January while the heaviest uses of weed oils occurred during the month of April. The major uses of petroleum oils during the summer and fall months were seed alfalfa desiccation, selective weed control for carrot and insect control for citrus. Alternatives to current use of petroleum oils which may result in a reduction of emissions were evaluated. The study is reported in 3 volumes: an executive summary, the final report, and an appendix. (Author abstract by permission)

81-3437. Leung, S.; Peter, R.; Reed, W.; Johnson, R.; Ling, T. (Eureka Lab. Inc., Sacramento, CA) **Air pollution emissions associated with non-synthetic hydrocarbon applications for pesticidal purposes in california. Volume III. Appendices.** *US NTIS PB Rep* PB81-157,737: III: 536 pp.; 1980.

This report presents the results of a survey of the use of nonsynthetic hydrocarbon (NSHC) pesticides in California during 1977 and the associated volatile organic compound emissions. This is the last of a 3 volume report. This part of the report presents more detailed information than the other 2 volumes. This information is primarily presented in the form of raw data, and in some instances, in descriptions. Material presented here includes application and emission inventories, use patterns and alternatives to pesticide oil use, and impact assessment of the alternatives. The application and emission inventories provided a county-by-county and month-by-month distribution presentation. Use patterns of pesticide oil use were delineated according to agricultural, home and garden, and other non-agricultural uses. Alternatives to pesticide oil use were also identified. Assessment of impacts of each of the alternatives on the air quality, public health, energy con-

sumption, and economics were made. (Author abstract by permission, modified.)

81-3438. Fannick, N. (Health Hazard & Tech. Assist. Branch, NIOSH, Cincinnati, OH) **Health Hazard Evaluation Determination Report No. HHE 77-99-726, Dupont, Chambers Works, Deepwater, NJ.** *US NTIS PB Rep* PB81-167,843: 10 pp.; 1980.

Environmental surveys were conducted in October, 1979, to evaluate potential exposure to dinitrotoluene, chlorobenzene, dichlorobenzene, 1,3,5-trichlorobenzene, nitrobenzene, and 1-chloro-2-nitrobenzene at the Dupont Chamber Worksite in Deepwater, New Jersey. The evaluation was requested by the employees on behalf of an unspecified number of workers. Chlorobenzene concentrations ranged from undetectable to 1.9 mg/m^3, below the OSHA standard of 350 mg/m^3; dinitrotoluene ranged from undetectable to 0.042 mg/m^3, below the OSHA standard of 1.5 mg/m^3. None of the other compounds were detected. The author concludes that no hazards existed at this facility. (Author abstract by permission)

81-3439. Cullimore, D. R. (Dep. Biol., Univ. Regina, Regina, Saskatchewan S45 OA2, Canada) **The enumeration of 2,4-D degraders in Saskatchewan soils.** *Weed Sci.* 29(4): 440-443; 1981 (8 references).

Different Saskatchewan soils were studied to determine their populations of 2,4-D [(2,4-dichlorophenoxy) acetic acid] degraders and gross aerobic bacteria. Soil from Indian head field plots receiving relatively high field rates (1.12 or 1.68 kg/ha) of 2,4-D amine or ester applied annually over the previous 32 yr contained the highest population of degraders, ranging from 10^3 to 10^4 degraders/g soil. Control plots recorded lower populations of degraders ($2.5 \pm 0.5 \times 10^3$ degraders/g soil). Five soils from around the province were also studied, and a relationship was found between the rate of breakdown of ^{14}C-2,4-D in the soil and the number of degraders. Another soil from a different site at Indian Head, but of a similar type to that in the field plots, displayed a much slower rate of 2,4-D degradation and also a much lower degrader population (7 ± 2 degraders/g soil) when compared to the other 4 soils (4×10^2 to 9×10^2 degraders/g soil). The ratio of degraders to the total bacterial flora varied in all studies between $1:6.5 \times 10^2$ and $1:3 \times 10^5$. When 1030 soil isolates were screened for their ability to degrade 2,4-D using an agar-block extraction technique, none possessed this feature. This would support the hypothesis that the ratio of 2,4-D degraders to the total microbial flora was indeed large (at least $1:10^3$). (Author abstract by permission)

81-3440. Rogers, N. K.; Talbert, R. E. (Dep. Agron., Altheimer Lab., Univ. Arkansas, Fayetteville, AR 72701) **Dissipation and leaching of metriflufen under field and controlled conditions.** *Weed Sci.* 29(5): 561-565; 1981 (11 references).

Field and laboratory experiments were conducted in 1977 and 1978 to evaluate the movement and persistence in soil of metriflufen [methyl ester of 2-[4-(4-trifluoromethylphenoxy) phenoxy] propanoic acid] under different conditions. In the field, delaying incorporation of metriflufen did not affect its activity in Taloka silt loam for either yr as shown by bioassay with grain sorghum [*Sorghum bicolor* (L.) Moench]. Metriflufen activity in the soil persisted for 63 and 40 days after application in 1977 and 1978, respectively. In the laboratory, metriflufen moved through saturated soil columns to an average depth of 7.5 and 18.5 cm following the addition of 2.5 or 10 cm of water to the columns. In a growth chamber bioassay, grain sorghum growth in treated soil gave a dose-response in a range of 0.02 ppmw (I_{10}), 0.09 ppmw (I_{50}), and 0.38 ppmw (I_{90}). When soil treated with metriflufen at 1 ppmw was incubated for specified times under soil moisture levels of 5, 15, or 25% and temperature regimes of 15, 25, or 35°C, soil incubated at 15°C for as long as 75 days completely inhibited grain sorghum growth regardless of the other treatment variables. Grain sorghum growth inhibition was reduced with incubation time and warmer temperatures for treated soil maintained at 5 and 15% moisture, but sorghum growth inhibition persisted for treated soil incubated under wet (25% moisture) conditions. (Author abstract by permission)

81-3441. Brewer, F.; Talbert, R. E.; Lavy, T. L. (Overseas Div., Pioneer Hi-Bred Int. Inc., Des Moines, IA 50308) **Effect of DBCP on fluchloralin persistence.** *Weed Sci.* 29(5): 605-609; 1981 (16 references).

Three field studies were conducted over a 2-yr period to evaluate the persistence of fluchloralin [*N*-(2-chloroethyl) -2,6-dinitro-*N*- propyl-4-(trifluoromethyl) aniline], and to determine whether DBCP (1,2-dibromo-3-chloropropane) affected persistence. Fluchloralin was applied to field plots at 1.1 kg/ha with and without DBCP at 20.5 kg/ha. In the first study, soil samples were taken periodically over a 1-yr period and assayed for fluchloralin by both gas chromatography (GC) and a sorghum (*Sorghum bicolor* L. Moench AKS-516) root-elongation bioassay. Both methods of analysis indicated that fluchloralin persistence was unaffected by DBCP. An oat (*Avena sativa* L. Ora) bioassay of soil from the field plots 41 wk after treatment showed no residual herbicide activity. In the next 2 field studies, soil samples were taken periodically over a 32-wk period and assayed by GC for fluchloralin. A greenhouse sorghum bioassay of soil samples taken from both tests 32 wk after application showed residual activity of fluchloralin in 1 test, but differences were not attributable to DBCP. A 2-phase process of fluchloralin dissipation in field soil was indicated from

analysis of the data using a complex first-order regression, as opposed to a simple first-order regression. Half-life values describing fluchloralin persistence, using the complex first-order regression, ranged from 2.3 to 3.7 wk for the first phase and 9.5 to 26.7 wk for the second phase. (Author abstract by permission)

See also 81-3311, 81-3312, 81-3314, 81-3315, 81-3316, 81-3318, 81-3323, 81-3326, 81-3335, 81-3337, 81-3443, 81-3446, 81-3478, 81-3502, 81-3518, 81-3522, 81-3543, 81-3558, 81-3566, 81-3586, 81-3592, 81-3593, 81-3596, 81-3597 *and* 81-3600.

81-3442. Cockcroft, D. W.; Dosman, J. A. (Resp. Med. Sect., Dep. Med., Univ. Saskatchewan Coll. Med., Saskatoon, Saskatchewan, Canada) **Respiratory health risks in farmers.** *Ann. Int. Med.* 95(3): 380-383; 1981 (20 references).

Farmers appear at risk from inhaling substances suspended in their environment, including insecticides and herbicides. Organophosphate insecticides are thought to produce asthma by means of cholinesterase inhibition. Farmers with preexisting nonspecific bronchial hyperreactivity may develop bronchospasm from the nonspecific irritant effects on the various dusts, fumes, and gases to which they are exposed. Acute toxic effects of inhaled chemicals and gases may occur throughout the respiratory tract. Relatively inert insoluble chemicals such as paraquat may cause pulmonary edema.

81-3443. Groszyk, W. S. (Water Plan. Div., US EPA, Washington, DC) **Nonpoint source pollution control strategy.** In: *Best Management Practices for Agriculture and Silviculture. Proceedings of the 1978 Cornell Agricultural Waste Management Conference.* Loehr, R. C., Haith, D. A., Walter, M. F. and Martin, C. S., eds. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH01: 3-10; 1979.

Two major elements of the EPA's nonpoint source (NPS) pollution control strategy and 2 amendments to the Clean Water Act of 1977 are discussed in relation to their implementation and to the use of available resources needed to solve the most urgent water pollution problems. Methods already exist for controlling or reducing pollution by nutrients, sediments, pesticides, and coliforms in natural streams. Speedy action on implementing NPS controls is advocated by the EPA. The Rural Clean Water Program (RCWP) is defined, and the qualifications needed for an area to obtain RCWP financial assistance are discussed. In order to be designated as a RCWP project area, the water quality problems must be related to agricultural pollutants such as fertilizers, pesticides, or other farm wastes or erosion conditions. Aspects of the 208 plan in relation to better management practices and integrated pest management programs are mentioned.

81-3444. Oppelt, E. T. (US EPA, Cincinnati, OH) **Thermal destruction options for controlling hazardous wastes.** *Civ. Eng. (NY)* 51(9): 72-75; 1981.

The thermal destruction of hazardous wastes is discussed. A recent US EPA regulation on incineration of hazardous wastes requires 99.99% destruction, 99% removal of HCl gas from exhaust gas, and no more than 180 mg dry particulate matter/dry m^3 of exhaust gas. The design and operation of incinerators for hazardous compounds, including pesticides, are discussed. Some alternative methods include the use of cement kilns, industrial boilers, incineration at sea, and transportable incineration facilities.

81-3445. Zober, A.; Schaller, K. H.; Gossler, K.; Krekeler, H. J. (Inst. Arbeits- & Sozialmed., Univ. Erlangen-Neurnberg, D-8520 Erlangen, BRD) **Pentachlorphenol und Leberfunktion: Eine Untersuchung an beruflich belasteten Kollektiven. [Pentachlorophenol and liver-function: a pilot-study on occupationally exposed groups.]** *Int. Arch. Occup. Environ. Health* 48(4): 347-356; 1981 (12 references) (German).

Two groups of persons occupationally exposed to pentachlorophenol (PCP) were studied. The first group consisted of persons engaged in the production of wood preserving agents. The second group consisted of persons who applied these agents. The concentrations of PCP in the ambient air at the workplaces were lower than the presently accepted MAK-value of 500 $\mu g/m^3$ by a factor of 30 for the first group, and a factor of 200 for the second group. Plasma concentrations of PCP ranged from 0.02 to 2.4 μg/ml. Renal excretion of PCP varied between 6 and 2111 $\mu g/g$ creatinine. These values were significantly higher than the values found in controls. There did not appear to be a correlation between the duration of the exposure and the PCP concentrations in the samples studied. A rise in immunoglobulin levels was noted in 6 persons. This rise was interpreted as the result of an increased mesenchymal activity. No dose/effect relationship was proved. Markedly elevated serum GLDH-activities were demonstrated in both groups. About 40% of the group engaged in the production of the chemical exhibited an isolated elevation of serum GLDH-activity.

81-3446. Triebig, G.; Krekeler, H.; Gossler, K.; Valentin, H. (Inst. Arbeits- & Sozialmed., Univ. Erlangen-Nuernberg, D-8520 Erlangen, BRD) **Untersuchungen zur neurotoxizitaet von Arbeitsstoffen. II. Messung der motorischen und sensorischen Nervenleitgeschwindigkeit bei beruflich pentachlorphenol- belasteten Personen. [Investigations on neurotoxicity of chemical substances in the workplace. II. Determination of the motor and sensory nerve conduction velocity in persons occupationally exposed to pentachlorophenol.]** *Int. Arch. Occup. Environ. Health* 48(4): 357-367; 1981 (22 references) (German).

Eighteen workers from a factory where pentachlorophenol (PCP) is processed were examined for possible effects caused by exposure to the chemical. The workers included 3 women and 15 men, with a mean time of employment and possible exposure of 12 yr. Gas chromatography was used to analyze PCP in blood and urine samples. Velocities of the ulnar and/or median nerve were measured to evaluate possible changes in the peripheral nervous system. Plasma PCP levels ranged between 0.02 and 1.5 ng/l (median 0.25 ng/l) and in urine between 13 and 1224 μg/l (median 112 μg/l) or between 11 and 2111 $\mu g/g$ creatinine, median 111 $\mu g/g$ creatinine). A mild degree of slowing in the PCP-group was noted by the median values of the neurophysiological parameters. This decrease was significant in the case of the sensory nerve conduction velocities. A dose-effect relation between inter-

nal PCP-load and the nerve conduction velocities was not demonstrated. It was suggested that in some cases decreased nerve conduction velocity was caused by chronic exposure to PCP.

81-3447. Clark, R. P. (Pestic. & Toxic Subst. Branch, US EPA, Atlanta, GA) **Three Federal environmental acts important to aquatic plant management.** *J. Aquat. Plant. Manage.* 18: 41-43; 1980.

The impact of the Clean Water Act, the Resource Conservation and Recovery Act, and the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) on aquatic plant management is discussed. The first of these acts contains provisions for the cleanup of oil spills and other environmental emergencies that would harm water quality, recreational facilities or the propagation of fish, shellfish or wildlife. The second act amends the Solid Waste Disposal Act and provides for the regulation of hazardous wastes including the disposal of pesticide containers. FIFRA relegates the authority to register pesticides and aquatic herbicides. Amendments to FIFRA define the laws of pesticide application and use, and give additional authority to the States in registering pesticides to meet special local needs. As a safeguard to protect the aquatic environment and water resources, aquatic weed control personnel must be certified by the State.

81-3448. Rodriguez Hernandez, J. L.; Gonzalez Miranda, F.; Ansuategui Sanchez, M. (Dep. Anestesiol. & Reanimacion, Hosp. Gen. & Clin. Tenerife, Tenerife, Canary Islands) **Intoxicacion por pesticidas organofosforados. Estudio epidemiologico, etiologico y terapeutico. [Organophosphorus pesticide intoxication. Epidemiologic, etiologic and therapeutic study.]** *Rev. Sanid. Hig. Publica* 53(3-4): 533-547; 1979 (9 references) (Spanish).

Case histories of 31 incidences of organophosphate pesticide poisoning on the island of Tenerife are discussed. Seventeen of the cases involved agricultural workers, most of whom were male. Thirteen of the cases involved parathion. The most frequent type of intoxication (35%) was by voluntary ingestion. One of the patients was treated by hemoperfusion with activated charcoal. The mortality reported here was lower than has been reported by other investigators.

81-3449. Singer, J. (Methods Appl. Group, For Insect & Dis. Manage., For Serv., USDA, Davis, CA 95616) **Pesticide safety. Guidelines for personnel protection.** *US For. Serv. Rep.* 45 pp.; 1980 (26 references).

This publication provides information for the safe use of pesticides while they are being handled, stored, and applied in the field. General rules for safety with pesticides are given; it is emphasized that safety must be part of the initial planning of any project. Knowledge about the specific pesticides being used on any project is essential for safety. The labels should be read and understood before developing the safety plan, before storing the chemical, before mixing the preparation, and before disposing of left over chemicals or containers. Protective clothing, (coveralls, aprons, spray suits, gloves, hats, and boots) is described, and proper care of the clothing is discussed. Types of eye, mouth, and face protection are reviewed. Safety during application and clean-up procedures is considered. Proper response to spills and fires is presented, including methods of stopping the spread of the contaminant, removing contaminated material, decontaminating the area, and obtaining help. Symptoms of poisoning are listed for carbamates, chlorinated hydrocarbons, chlorophenoxys, dipyridyls, organophosphates, triazines, and substituted ureas. First aid steps are also listed.

81-3450. Schulte, P. A. (Health Hazard & Tech. Assist. Branch, Natl. Inst. Occup. Saf. & Health, NIOSH, Cincinnati, OH) **Technical Assistance Report No. TA 79-50, International Association of Firefighters, Alliance, Ohio.** *US NTIS PB Rep* PB81-171,134: 15 pp.; 1980.

Medical interviews were conducted with 79 firefighters present at a pesticides warehouse fire in July, 1974, in Alliance, Ohio. The survey was requested by the International Association of Firefighters, and was performed during December 1979 and January 1980. A questionnaire to evaluate the current psychological conditions of the firefighter was also administered. A high incidence of cough, memory loss, tension, depression, fatigue, and confusion was found in the personnel at the fire when compared to firefighters from another city. The author suggests that the adverse health effects resulted from exposures during the fire. He recommended periodic physical examinations for firefighters, use of protective equipment, and provision of means for the outlet of tensions and pressures that build during periods of inactivity between cells. (Author abstract by permission)

81-3451. Zadorozhny, B. A.; Petrov, B. R.; Olefirenko, V. A.; Kirilko, V. A. (Dep. Skin & Vener. Dis., Kharkov Med. Inst., Kharkov, USSR) **Professional'nye dermatozy i ikh profilaktika v usloviyakh proizvodstva pestitsidov. [Occupational dermatoses and their control under conditions of pesticide manufacture.]** *Vestn. Dermatol. Venerol.* (6): 48-51; 1981 (8 references) (Russian).

Studies have shown that treatment of guinea pig skin with hexachloran (BHC), gamma-isomer of hexachloran (lindane), tetramethylthiuram disulfide (thiram), copper trichlorophenolate, and phenthiuram produces dermatitis in the form of erythema, moderate infiltration, and allergenic reaction. Examination of 241 workers who had an occupational exposure to pesticides showed that 21

(8.7%) had simple contact dermatitis, 25 (10.3%) allergic dermatitis, and 7 (2.9%) eczema. Treatment and prophylactic measures were recommended as follows: preliminary medical examination and examination by a dermatologist of persons beginning work; periodic medical examination every 6 mo for persons exposed to pesticides; weekly visit of a dermatologist to the employee health service; clinic for patients with occupational dermatoses or skin conditions.

81-3452. Kaskevich, L. M.; Komarova, L. I.; Ilyina, V. I.; Ivanitsky, V. A.; Shilina, V. F. (Clin. Dep., All-Union Res. Inst. Public Health & Toxicol. Pestic. Polym. & Plast., USSR) **Kliniko-funktsional'nye izmeneniya u podvergayuschikhsya bozdeistviyu tsineba. [Clinical-functional changes in persons exposed to zineb.]** *Vrach. Delo* (8): 109-112; 1981 (7 references) (Russian).

Examination of 137 persons having occupational contact with zineb revealed functional changes in the nervous system (mainly vascular dystonia), diseases of the hepatobiliary system, contact dermatitis, menstrual disorders, and inflammatory genital diseases in women. Early functional changes due to zineb included a disturbance of biogenic amine metabolism expressed by a reduction in 5-hydroxyindoleacetic acid excretion and an imbalance in the relative activity of catecholamine metabolism, a decrease in redox enzyme activity of peripheral blood leukocytes and disturbance of intrahepatic hemodynamics. These disturbances in humoral regulatory mechanisms may play a role in the appearance and development of diseases of the nervous and hepatobiliary systems. Prophylactic medical examination of workers of exposed to zineb was recommended.

81-3453. Krasnyuk, E. P.; Timofeeva, N. T. (Kiev Res. Inst. Work Hyg. & Occup. Dis., Kiev, USSR) **Profilakticheskie meditsinskie osmotry pabotnikov sel'skog khzyaistva. [Prophylactic medical examination of agricultural workers.]** *Vrach. Delo* (8): 121-124; 1981.

In regions with a high intensity of pesticide use, diseases such as myocarditis, chronic coronary insufficiency, chronic diseases of the peripheral nervous system, and digestive system were found to be more common than normal. In persons using pesticides, functional dynamic central nervous system disturbances (vascular dystonia, astheno-vegetative syndrome) were detected in approximately every third examination. Diseases of the peripheral nervous system, cardiovascular diseases with hypertensive reactions, disease of the liver and bile-secreting ducts, and cerebral atherosclerosis in persons < 40 yr old were 2-3 times as common as in controls. It is recommended that persons working with pesticides should undergo examination by a neuropathologist and a gynecologist, and that those working with organochlorine pesticides and carbamic acid derivatives should also have urinalysis and blood tests. Persons in contact with pesticides should be examined once every 6 mo.

See also 81-3311, 81-3316, 81-3339, 81-3360, 81-3391, 81-3397, 81-3405, 81-3407, 81-3472, 81-3492, 81-3494, 81-3502, 81-3507, 81-3510 *and* 81-3514.

81-3454. Bakalivanov, D.; Kostov, O. (N. Pousharov Inst. Soil Sci. & Yield Program., Sofia, Bulgaria) **Soil microbiological assessment of toxicity of alkanoate, amide and other herbicides.** *Acta Microbiol. Acad. Sci. Hung.* 28(2): 141-146; 1981 (4 references).

Studies were designed to determine the effects of several herbicides on soil microorganisms and rates of nitrification in 2 soil types. Soil samples were treated with herbicides (2,4-D, MCPA, diphenamid, allidochlor, propachlor, dichlobenil, trifluralin, dalapon, lenacil, and bromacil), then assayed for the growth of microorganisms on agar plates. Nitrification was assayed by monitoring changes in nitrogen content in the soil. At a concentration of 80 mg/kg, all herbicides reduced nitrification. Propachlor was the most toxic in smolnitsa soil (high clay content). MCPA, CDAA, propachlor, and bromacil were the most toxic in alluvial soil. CDAA inhibited microorganisms to the greatest extent in both soils; however, herbicide toxicity was generally lower with smolnitsa soil because of its greater absorptive properties.

81-3455. Rhodes, H. A.; Wilson, W. T.; Sonnet, P. E.; Stoner, A. (Honey Bee Pestic. Dis. Res., Agric. Res., SEA, USDA, Laramie WY 82071) **Honey bees die from pollen contaminated fourteen months earlier with Penncap-M.** *Am. Bee J.* 120(8): 577-580, 588-589; 1980 (12 references).

A study was conducted to determine the toxicity of Penncap M (microencapsulated, time-release methyl parathion) to honeybees. Pollen suspected of being exposed to Penncap-M up to 14 mo prior to testing was introduced to hives. Mortality was 72 times higher than normal for the first 48 hr after introduction of the pollen. After 1 wk, mortality was 4-10 times higher than normal. Within 4 wk, mortality was normal. The concentration of methyl parathion was 26 ppm in the pollen, 0.03 in the wax, and 0.05 ppm in the honey.

81-3456. Cairns, J.; Hart, K. M.; Henebry, M. S. (Biol. Dep., Univ. Cent. Environ. Stud., Virginia Polytech. Inst., Blacksburg, VA 24061) **The effects of a sublethal dose of copper sulfate on the colonization rate of freshwater protozoan communities.** *Am. Mid. Nat.* 104(1): 93-102; 1980 (17 references).

The relationship between maturity of a freshwater protozoan community and its ability to act as an epicenter, supplying colonists, under conditions of toxic stress was studied. Polyurethane foam units were used as artificial substrates for the epicenters of the colonization system. In one test, the epicenters were allowed to accumulate species for 20 days in the lake; in the second test, epicenters were colonized for 1 day only. Experiments were run during consecutive summers and identical conditions were maintained as nearly as possible. Stress conditions were created by the presence of copper sulfate at 1000 ppm. The presence of a sublethal dose of copper sulfate inhibited the colonization process. The stage of protozoan community development influenced the extent of the inhibition. No evidence is available to predict the cause-effect pathways of microbial communities or to explain differences in microbial sensitivity to copper at the biochemical level.

81-3457. Fisher, D. J.; Hayes, A. L. (Long Ashton Res. Stn., Univ. Bristol, Bristol BS18 9AF, England) **Effects of some fungicides used against cereal pathogens on the growth of *Rhizobium trifolii* and its capacity to fix nitrogen in white clover.** *Ann. Appl. Biol.* 98(1): 101-107; 1981 (13 references).

The effects of a range of systemic fungicides used against cereal pathogens have been measured on the growth of *Rhizobium trifolii in vitro* and on growth, root nodulation and nitrogen-fixing capacity of clover plants. The various fungicides tested included benodanil, benomyl, carbendazim, carboxin, ethirimol, fenarimol, oxycarboxin, pyracarbolid, tridemorph, and triforine. Only 2 of these compounds, fenarimol and oxycarboxin, affected growth on agar when present in small amounts. At the lowest concentrations tested none of the fungicides in the soil had a significant effect on growth. Fresh wt of 11-wk-old plants were significantly reduced by carboxin and oxycarboxin at the medium concentrations and by the highest concentrations of benodanil, pyracarbolid, and tridemorph. Nitrogen fixation was affected by carboxin, oxycarboxin and tridemorph at the highest concentrations in the soil. Nodulation was reduced from 148 to 33 nodules/g dry root by tridemorph at the highest concentration. If applied at the recommended rates, none of these compounds appears likely to affect nitrogen fixation in the field.

81-3458. Vincken, W.; Huyghens, L.; Schandevyl, W.; Verbeelen, D.; Corne, L. (Academic Hosp., Free Univ. Brussels, Brussels, Belgium) **Paraquat poisoning and colchicine treatment.** *Ann. Int. Med.* 95(3): 391-392; 1981 (5 references).

A 32-yr-old patient ingested 50 g of a mixture of 2.5% paraquat and 2.5% diquat, and was subsequently admitted with burning retrosternal and epigastric pain. Tachycardia, moderate tachypnea, and distended abdomen were noted. Blood levels of paraquat and diquat were critically elevated; aggressive therapy included cathartics, forced diuresis, hemoperfusion on a charcoal column, and iv methylprednisolone. Oxygen was not administered. The patient was discharged 12 days after admission and given prednisolone, 30 mg/kg orally. Three days later, mild dyspnea on exertion necessitated readmission of the patient. Fine inspiratory crackles were present at both lung bases. Moderate hypoxemia was noted at rest. Interstitial cellular infiltration and fibrosis developed despite continued corticosteroid therapy. After colchicine treatment was begun no decline of single-breath diffusion capacity for carbon monoxide (DLCO) was noted. Prednisolone

treatment was tapered and discontinued, and the DLCO attained almost normal values. The patient has had no adverse effects after 6 mo of daily colchicine therapy.

81-3459. Rodriguez-Kabana, R.; Curl, E. A. (Dep. Bot. Plant Pathol. & Microbiol., Auburn Univ., Agric. Exp. Stn., Auburn, AL 36830) **Nontarget effects of pesticides on soilborne pathogens and disease.** *Annu. Rev. Phytopathol.* 18: 311-332; 1980 (104 references).

The effects of a variety of pesticides on non-target soil organisms are discussed. Phosphorothioate nematicides have a deleterious effect on several soil fungi. This can be beneficial, since pathogenic fungi will often be reduced. Conversely, some fungicides [PCNB (quintozene) and ethazole (etridiazol)] have an inhibitory effect on soil nematodes. Not all fungicides, however, have nematicidal properties. Several, including the carbamate types, stimulate nematode egg hatching. Little is known about the effects of herbicides on nematodes; however, several cases of nematicidal activity are discussed. Further discussion is presented on the effects of various classes of compounds on non-target organisms.

81-3460. Tabata, K.; Kitahara, E. (For. & For. Prod. Res. Inst., Tsukuba Norin Kenkyu Danchi-nai, Ibaraki 305, Japan) **Effects of fenitrothion (Sumithion) spraying on the population density and the blood cholinesterase activity of the Japanese wood mouse, *Apodemus speciosus* Temmink.** *Appl. Entomol. Zool.* 15(3): 242-248; 1980 (9 references).

Population investigations of the Japanese wood mouse were carried out by the mark and release method in areas subject to aerial application of fenitrothion applied by helicopter twice annually at 1.2 kg/ha. Of the individuals captured during the period May to early July, 60-70% consisted of juveniles or subadults. This season corresponded to the 1st and 2nd application times in Yachimata area and the 1st application time of the Kukisaki area, and may be the premigration period for the mice. Mouse population showed a rapid decrease just after application in the Kukisaki area; it seemed unlikely that this was solely attributable to the chemical spray, as no evidence of toxic effects of fenitrothion were found. Plasma cholinesterase activity did not decrease during or after aerial application. Erythrocyte cholinesterase activity fluctuated just after application and then recovered. A vast difference in cholinesterase activity was noted between June 7 and 8, and was attributed to the age of the mice. It was concluded that there was no toxic effect of fenitrothion on mice inhabiting areas aerially treated with fenitrothion.

81-3461. Sanders, H. O.; Huckins, J.; Johnson, B. T.; Skaar, D. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia, MO 65201) **Biological effects of Kepone and mirex in freshwater invertebrates.** *Arch. Environ. Contam. Toxicol.* 10(5): 531-539; 1981 (21 references).

Acute and chronic toxicity studies of Kepone (chlordecone) and mirex were conducted with daphnids *(Daphnia magna)*, amphipods *(Gammarus pseudolimnaeus)*, and larvae of a midge *(Chironomus plumosus)*. Acute toxicities of Kepone ranged from a 48-hr EC50 of 350 μg/l for midges to a 96-hr LC50 of 180 μg/l for amiphipods, whereas the acute toxicities of mirex to all 3 taxa exceeded 1000 μg/l. Maximum acceptable toxicant concentrations (MATC's) for Kepone and mirex were estimated by measuring reproduction of daphnids, growth of amphipods, emergence of midges, and survival of all organisms. MATC for Kepone was estimated to be between 9 and 18 μg/l for daphnids, between 1 and 2 μg/l for amphipods, and between 8.4 and 18 μg/l for midges; MATC for mirex exceeded 34 μg/l for daphnids and midges, but less than 2.4 μg/l for amphipods. The concentration of Kepone and mirex accumulated by daphnids was 760 and 8025 times, respectively, the concentration in water. Estimated times for elimination of 50% of the residues by daphnids were 141 hr for Kepone and 12 hr for mirex. (Author abstract by permission)

81-3462. Courtney, K. D.; Ebron, M. T. (Environ. Toxicol. Div., Health Effects Res. Lab., US EPA, Research Triangle Park, NC 27711) **2,4,5-T effects on cardiac and serum lactic dehydrogenase (LDH) and creatine kinase (CK) isozymes. I. Maternal enzyme activities and isozyme profiles.** *Arch. Environ. Contam. Toxicol.* 10(5): 571-581; 1981 (24 references).

Pregnant mice were exposed to 100 mg/kg 2,4,5-T, IG, on gestation days 6 through 17, and sacrificed on postpartum day 1 or 21. Toxicologic evaluation showed no changes in body wt, heart wt, heart to body wt ratio, or cardiac supernate protein between corn oil control and 2,4,5-T treated mice on days 1 or 21 postpartum (pp). There were no effects of 2,4,5-T treatment on the total LDH enzyme activity of cardiac supernate on day 1 or 21pp. Serum LDH total activity was depressed on day 1pp and comparable to control values on day 21pp. Cardiac CK total activity was elevated on day 1pp, but not on day 21pp. Serum CK total activity on day 1 was comparable to control values; however, on day 21, a significant decrease in activity was observed. Cardiac LDH and CK isozyme profiles were normal on days 1 and 21pp. The serum LDH isozyme profile was normal at both times. The serum CK isozyme profile on day 1 was markedly altered by the appearance of 2 aberrant isozyme bands while on day 21, there was a profile shift with an increase in the BB band and a compensatory decrease in the MM band. These changes in creatine kinase suggest metabolic or pathologic changes in the cardiac muscle. (Author abstract by permission)

81-3463. Courtney, K. D.; Ebron, M. T. (Environ. Toxicol. Div., Health Effects Res. Lab., US EPA, Research Triangle Park, NC 27711) **2,4,5-T effects on cardiac and serum lactic dehydrogenase (LDH) and creatine kinase (CK) isozymes. II. Neonatal enzyme activities and isozyme profiles.** *Arch. Environ. Contam. Toxicol.* 10(5): 583-595; 1981 (23 references).

Neonates from CD-1 mice, which were treated during gestation with 100 mg/kg of 2,4,5-T, were studied from day 1 to 30 postpartum (pp) for effects on cardiac development by determining total cardiac activities and isozyme profiles of LDH and CK. On day 1pp, the total activities and isozyme profiles of LDH of the neonatal hearts were normal. During the developmental period of day 7 through 15, changes were noted in the developmental pattern of LDH isozymes some of which continued to day 30. The CK isozyme profile on day 1pp showed a significant change and changes continued throughout the lactational period. During this period, the normal developmental isozyme patterns of LDH and CK were altered by prenatal exposure to 2,4,5-T suggesting metabolic derangement or pathological changes in the neonatal heart. (Author abstract by permission)

81-3464. Goldman, M. (Dep. Biol., Univ. South Dakata, Vermillion, SD 57069) **The effect of a single dose of DDT on thyroid function in male rats.** *Arch. Int. Pharmacodyn. Ther.* 252(2): 327-334; 1981 (20 references).

A single dose of 100 mg/kg of commercially available 1,1,1-trichloro- 2,2 bis(*p*-chlorophenyl) ethane, (DDT), dissolved in corn oil, was administered to adult male Sprague-Dawley rats by stomach tube and 2 indices of thyroid function were examined. The iodide transport function of the thyroid gland, determined by the thyroid: serum radioiodide concentration ration (T:S), was depressed, and complete inhibition in thyroidal radioiodine release occurred 8-10 hr following administration of DDT and continued for 24-30 hr. Subsequently the block in thyroidal ^{131}I release was followed by a return to a rate not significantly different from that of control rats. Whether the acute effects of a single large dose of DDT on thyroid function are a consequence of a local action on the thyroid gland or on pituitary thyrotropin release, or of some action elsewhere, is not clear. (Author abstract by permission)

81-3465. Osterman, J.; Zmyslinski, R. W.; Hopkins, C. B.; Cartee, W.; Lin, T.; Nankin, H. R. (Med. Serv., William Jennings Bryan Dorn Veterans Hosp., Columbia, SC 29201) **Full recovery from severe orthostatic hypotension after Vacor rodenticide ingestion.** *Arch. Intern. Med.* 141(11): 1505-1507; 1981 (9 references).

A 42-yr-old man attempted suicide in April by ingesting 6 packets of Vacor rat killer, 4.68 g of *N*-3 pyridilmethyl-*N'*- *p*-nitrophenyl urea (pyriminil; PNU). Symptoms included weakness, blurred vision, polyuria, and thirst. Gastric lavage was performed. Plasma glucose level at 22 hr after ingestion was 628 mg/dl with a carbon dioxide content of 19 mEq/l. During the first 3 days in the hospital, the patient developed urinary retention and urinary and fecal incontinence, progressive severe muscle weakness, and severe visual field constriction. During wk 3, the patient became hyponatremic; laboratory findings suggested inappropriate secretion of antidiuretic hormone. When the patient was moved for physical therapy, he developed severe orthostatic hypertension. Initial treatments with elastic stockings, fludrocortisone acetate, and dihydroergotamine mesylate resulted in no obvious improvement of his orthostasis. Gradual improvement occurred after 4 mo; by 8 mo, dihydroergotamine was discontinued with no effect on orthostatic symptoms. At discharge from the hospital 11 mo after PNU ingestion, the patient had no orthostatic symptoms and could walk unassisted; he continued to take isophane insulin for diabetic control and remained areflexic with severe sensory loss below the knees.

81-3466. Omata, S.; Tsubaki, H.; Sakimura, K.; Sato, M.; Yoshimura, R.; Hirakawa, E.; Sugano, H. (Dep. Biochem., Fac. Sci., Univ. Niigata, Igarashi-2, Niigata 950-21, Japan) **Stimulation of protein and RNA synthesis by methylmercury chloride in the liver of intact and adrenalectomized rats.** *Arch. Toxicol.* 47(2): 113-123; 1981 (45 references).

Male Sprague-Dawley rats were given a single sc injection of methylmercuric chloride (MMC), 0.5-50 mg/kg; some of the rats underwent adrenalectomy. At different times after injection, the brain and liver were removed from each rat; each organ was homogenized separately and a post mitochondrial supernatant obtained. Significant stimulation of *in vitro* incorporation of leucine into the protein of the liver PMS fraction was noted 1 and 2 days after the injection. Stimulation had decreased by 7 days. Similar stimulation was noted when the incorporation of leucine was assayed *in vivo*, although the degree of stimulation was slightly lower. No appreciable stimulation was found in either *in vivo* or *in vitro* protein synthesis in the brain. The concentration of MMC in the PMS fraction was 43.32 μg/ml in the liver and 0.43 μg/ml in the brain. Protein synthesis in the liver increased significantly at doses of MMC > 10 mg/kg. At a dose of 50 mg/kg, stimulation was 188% of the control. Protein synthesis in the brain was unaffected by doses up to 20 mg/kg and was significantly decreased at 50 mg/kg. Tyrosine aminotransferase activity in the liver PMS fraction also increased in a dose-dependent manner. Adrenalectomy abolished the stimulatory effects on protein synthesis and RNA polymerase activities at 10 mg/kg MMC. However, at 20 mg/kg, stimulation of protein and RNA synthesis was noted, even in adrenalectomized rats. The effect of MMC on serum protein fractions was not uniform, and it is suggested that MMC may accelerate anabolism and catabolism of serum albumin.

81-3467. Gyrd-Hansen, N. (Dep. Pharmacol. & Toxicol., Res. Vet. & Agric. Univ., DK-1870 Copenhagen V, Denmark) **Toxicokinetics of methyl mercury in pigs.** *Arch. Toxicol.* 48(2-3): 173-181; 1981 (35 references).

Toxicokinetics of methyl mercury were studied in pigs after iv administration of methyl mercury chloride. The distribution of methyl mercury was slow, taking 3-4 days to be completed. Blood elimination half-life was found to be 25 days. The apparent volume of distribution was 9.8 l/kg, indicating pronounced tissue accumulation of methyl mercury. Highest mercury levels were found in kidney and liver, with lower contents in muscle and brain and very little in adipose tissue. The results indicate that from organs like liver and kidney methyl mercury is eliminated much more slowly than from the blood. Over a period of 15 days 16% of the dose administered was excreted with feces and 0.9% in the urine. (Author abstract by permission, modified)

81-3468. Nimmo, D. R.; Hamaker, T. L.; Matthews, E.; Moore, J. C. (Environ. Res. & Technol. Inc., Fort Collins, CO) **An overview of the acute and chronic effects of first and second generation pesticides on an estuarine mysid.** In: *Biological Monitoring of Marine Pollutants.* Vernberg, F. J., Calabrese, A., Thurberg, F. P., and Vernberg, W. B., eds. (Academic Press: New York): pp. 3-19; 1981 (21 references).

Data are summarized from 11 studies in which toxicity of pesticides against the mysid shrimp *Mysidopis bahia* was determined. The mysids were exposed to the following pesticides in flowing saltwater through 1-2 life cycles (total 28 days): DEF, diazinon, Dimilin (diflubenzuron), EPN, Kepone (chlordecone), leptophos, methyl parathion, phorate, carbaryl, toxaphene, and trifluralin. The LC50 95% confidence limit and the maximum acceptable toxicant concentration (MATC) were calculated for each toxicant tested. All the pesticides except trifluralin (96-hr LC50 > 136.0 μg/l) were acutely toxic to *Mysidopsis bahia.* Phorate was the most acutely toxic, with a 96-hr LC50 of 0.33 μg/l. In acute tests, juveniles showed greater sensitivity than adults. In studies of entire life cycles, Kepone was the most toxic chemical. Calculation of the Application Factor, which is in the ratio of the 96-hr LC50 to the MATA, indicated that acute tests may sometimes predict chronic effects.

81-3469. Cripe, G. M.; Nimmo, D. R.; Hamaker, T. L. (Gulf Breeze Environ. Res. Lab., EPA, Gulf Breeze, FL) **Effects of two organophosphate pesticides on swimming stamina of the mysid *Mysidopsis bahia.*** In: *Biological Monitoring of Marine Pollutants.* Vernberg, F. J., Calabrese, A., Thurberg, F. P., and Vernberg, W. B., eds. (Academic Press: New York): pp. 21-36; 1981 (33 references).

Studies were conducted to determine the effects of phorate and methyl parathion on the swimming stamina of the mysid *Mysidopsis bahia.* Ten to fifteen mysids were placed in a test tunnel, and the water flow was slowly increased to determine the maximum sustained speed (MES). Organisms were then exposed to 0.18, 0.78, and 0.045 μg phorate/l and 0.58, 0.31, and 0.1 μg methyl parathion/l. These concentrations were lower than the LC50 values for both pesticides. Phorate at 0.78 and 0.18 μg and methyl parathion at 0.58 μg significantly reduced the MES. Results of tests conducted to 28 days after 96-hr exposure were similar, suggesting test this as a rapid screening bioassay.

81-3470. Rao, K. R.; Fox, F. R.; Conklin, P. J.; Cantelmo, A. C. (Dep. Biol., Univ. West Florida, Pensacola, FL) **Comparative toxicology and pharmacology of chlorophenols: studies on the grass shrimp, *Palaemonetes pugio.*** In: *Biological Monitoring of Marine Pollutants.* Vernberg, F. J., Calabrese, A., Thurberg, F. P., and Vernberg, W. B., eds. (Academic Press: New York): pp. 37-72; 1981 (53 references).

The toxicity of 7 chlorophenols to grass shrimp (*Palaemonetes pugio*) at known stages of the molt cycle was investigated. Tests of acute toxicity on the effect of chlorophenols on limb regeneration were performed. Uptake, tissue distribution, and depuration of ^{14}C-2,4,5-trichlorophenol and ^{14}C-pentachlorophenol (^{14}C-PCP) were studied. Thin layer chromatography and autoradiography were used to identify the metabolites of ^{14}C-PCP. All chlorophenols tested except 2,4-dichlorophenol were more toxic to molting than to non-molting shrimp. This can be explained by tracer studies which indicate increased bioaccumulation of ^{14}C-2,4,5-trichlorophenol and ^{14}C-PCP during the period shortly after molting. No correlation was found between toxicity of the chlorophenols and number of Cl atoms or ionization constants. PCP, 2,3,4,5-tetrachlorophenol, and 2,3,4,6-tetrachlorophenol caused dose-dependent inhibition of limb regeneration of the grass shrimp, while 2,4,5- and 2,4,6-trichlorophenol did not. Metabolism studies indicate methylation (anisole formation), glucuronide conjugation, and dechlorination to be among the pathways of PCB disposition in this species.

81-3471. Thomas, P.; Carr, R. S.; Neff, J. M. (Dep. Biol., Texas A&M Univ., College Station, TX) **Biochemical stress responses of mullet *Mugil cephalus* and polychaete worms *Neanthes virens* to pentachlorophenol.** In: *Biological Monitoring of Marine Pollutants.* Vernberg, F. J., Calabrese,A., Thurberg, F. P., and Vernberg, W. B., eds. (Academic Press: New York): pp. 73-103; 1981 (76 references).

The effects of PCP exposure on several biochemical parameters in juvenile mullet, *Mugil cephalus* and the sandworm *Neanthes virens* were studied. In *N. virens,* PCP exposure levels ranged from 120 ppb (chronic sublethal) to 720 ppb (acute lethal). At 365 ppb PCP,

marked coelomic fluid hypoglycemia occurred, and ascorbic acid was depleted from parapodial tissue within 48 hr. Following exposure to 120 ppb PCB, there was initially a rise in coelomic fluid glucose to 2 times the control level, a decline to control level by 96 hr, and a further decrease thereafter. Exposure to sublethal PCP doses resulted in a steady rise in in free ascorbic acid tissue, suggesting synthesis or mobilization of bound ascorbate reserves in response to sublethal stress. Mullet was more susceptible than *N. virens* to PCP, with 33% mortality occurring after 48-hr exposure to 100 ppb PCB. PCP exposure resulted in elevated plasma cortisol concentration, marked hyperglycemia, and depletion of hepatic glycogen reserves, along with slow rises in ascorbic acid concentration and serum osmolality.

81-3472. Peachey, R. D. G. (Bristol Royal Infirm., Bristol BS2 8HW, England) **Skin hazards in farming.** *Br. J. Dermatol.* 105(21): 45-50; 1981 (38 references).

Dermatological hazards to farmers in the United Kingdom are reviewed. A large number of pesticides are known to cause dermatitis; those most frequently causing problems are organomercurial compounds, paraquat, and thiuram (thiram). Insecticides, fungicides, herbicides, and growth regulators are also of concern. Parathion and malathion are known contact sensitizers, but no clinical cases have yet been reported from normal usage. Four cases of contact dermatitis due to the fungicide Plondrel (ditalimfos) have been reported. Dithiocarbamates and thiurams have also been involved in dermatitis cases. No cases of contact dermatitis due to paraquat or diquat have been reported, but one case of skin ulceration due to contact with paraquat solution does appear in the literature. Contact dermatitis was reported as a result of the amine herbicides, Randox (CDAA). Brushwood and nettle killers usually contain 2,4,5-T, but the dioxin content is concluded to be too low to be of concern.

81-3473. McLeese, D. W.; Metcalfe, C. D. (Fish. & Environ. Sci., Dep. Fish. & Oceans, Biol. Stn., St. Andrews, New Brunswick, Canada) **Toxicities of eight organochlorine compounds in sediment and seawater to *Crangon septemspinosa*.** *Bull. Environ. Contam. Toxicol.* 25(6): 921-928; 1980 (18 references).

Lethality of organochlorines in water was determined in static tests using 3 *Crangon* (2.0 g each) in 2 l of seawater. After 48-hr exposure, the animals were transferred to new beakers with freshly prepared solutions; tests were terminated at 96 hr. Chlordane, endrin, Aroclor 1242, and DDT were tested at 10 and 20°C. Endosulfan, dieldrin, Aroclor 1254, and HCB were tested at 20°C. Seven of the 8 compounds were extremely toxic, with 96-hr LC50s ranging from ~ 0.2-13 μg/l. In tests with sediment, there were no mortalities with HCB, Aroclor 1242, and Aroclor 1254 at the maximum concentrations tested. There appeared to be close agreement between LT50s for *Crangon* at the average concentrations measured in the surficial water and the LT50s from tests without sediment but with similar concentrations in the water. These results suggest that the compounds adsorbed to sediment contribute little towards the toxicity.

81-3474. Tam, T. Y.; Trevors, J. T. (Dep. Biol., Univ. Waterloo, Waterloo, Ontario N2L 3GL, Canada) **Toxicity of pentachlorophenol to *Azotobacter vinelandii*.** *Bull. Environ. Contam. Toxicol.* 27(2): 230-234; 1981 (20 references).

Studies were designed to determine the toxicity of sodium-pentachlorophenol (Na-PCP) to the nitrogen-fixing bacteria *Azotobacter vinelandii*. In culture, 1.1×10^{11} cells/ml were incubated with Na-PCP. Pure acetylene was injected into the headspace of the vials. At appropriate intervals, C_2H_2, C_2H_4, CO_2, and O_2 were determined by gas chromatography. Nitrogen fixation, as measured by C_2H_2 reduction, was inhibited by 50 mg Na-PCP/ml. Likewise, CO_2 evolution and O_2 consumption were reduced by Na-PCP. It was concluded that continued use of Na-PCP in fields could interfere with nutrient cycling microorganisms.

81-3475. Priyamavada Devi, A.; Rato, D. M. R.; Tilak, K. S.; Murty, A. S. (Dep. Zool., Nagarjuna Univ., Nagarjuna-nager 522510, India) **Relative toxicity of the technical grade material, isomers, and formulations of endosulfan to the fish *Channa punctata*.** *Bull. Environ. Contam. Toxicol.* 27(2): 239-243; 1981 (15 references).

The effects of endosulfan on the fish *Channa punctata* was studied. Flow-through bioassay procedures were used to expose the fish to a range of concentrations of the pesticide. A 96-hr LC50 was determined. An uptake and metabolism study was conducted on fish that survived the 96-hr exposure to 6.5 ppb. Tissues were analyzed for endosulfan and its metabolites. The LC50 varied for each formulation tested. LD50 values were: isomer A, 0.16 ppb; 35% EC, 2.5 ppb; technical grade, 4.8 ppb; isomer B, 6.6 ppb; and 4% dust, 16 ppb. Endosulfan was taken up by all tissues analyzed. Endosulfan lactone and endosulfan alcohol were recovered from all tissues. The hydroxy ether was found in brain, gills, and kidney. Endosulfan ether was found in kidney and liver. Both isomers were found in all tissues, but mostly in the liver and kidney. Because of its extreme toxicity, endosulfan is likely to pose serious problems to the aquatic environment.

81-3476. Seguchi, K.; Asaka, S. (Ageo Res. Lab., Agrochem. Div., Nippon Kayaku Co. Ltd., Ago, Saitama 362, Japan) **Intake and excretion of diazinon in freshwater fishes.** *Bull. Environ. Contam. Toxicol.* 27(2): 244-249; 1981 (8 references).

The intake and excretion of diazinon in carp, rainbow trout, loach, and shrimp were studied in the laboratory. Animals were exposed to 0.02 ppm diazinon for 14 days, then transfered to clean water for 7 days. The bioconcentration ratios were 120 (carp), 63 (trout), 26 (loach), and 3 (shrimp). When the animals were transfered to fresh water, diazinon and its metabolites were rapidly excreted. After 7 days in the clean water, the diazinon concentration decreased to 0.3-8.0% of the equilibrium concentration during exposure. The metabolites decreased to below detection limits.

81-3477. Tagatz, M. E.; Ivey, J. M. (Environ. Res. Lab., US EPA, Gulf Breeze, FL 32561) **Effects of fenvalerate on field- and laboratory-developed estuarine benthic communities.** *Bull. Environ. Contam. Toxicol.* 27(2): 256-267; 1981 (6 references).

Studies were conducted to determine the effects of fenvalerate on estuarine benthic communities. Unfiltered seawater was pumped into aquaria, and colonization by larvae occurred. Treatment tanks received 0.01, 0.1, and 1.0 μg/l. After 8 wk, animals were collected and identified. Total abundance of animals, but not number of species, was decreased by 1.0 μg/l. No *Corophium acherusicum* (89% of the total arthropods collected) occurred in 0.1 or 1.0 μg/l, but were unaffected by 0.01 μg/l. Other groups were not affected. Field tests were conducted by placing sand-filled aquaria on the bottom and allowing natural colonization. Tanks were then brought into the laboratory and treated with fenvalerate (0.1, 1.0, and 10.0 μg/l) for 1 wk. Total number of species, but not total abundance, was decreased by 10 μg/l. Arthropods and the chordate *Branchiostoma caribaeum* were reduced by all levels of toxicant. These tests indicate that fenvalerate could be very hazardous to the saltwater environment.

81-3478. Ferenbaugh, R. W.; Spall, W. D.; LaCombe, D. M. (Environ. Surveill. Group, Los Alamos Natl. Lab., Los Alamos, NM 87545) **Detection of bromacil herbicide in ponderosa pine.** *Bull. Environ. Contam. Toxicol.* 27(2): 268-273; 1981 (10 references).

Tree mortality, possibly resulting from bromacil, was investigated. A roadway a substantial distance from the trees was sprayed with the herbicide for vegetation control. Needles were collected from dying trees, and analyzed by GC/MS for bromacil content. Bromacil ranged from 30-50 ppm. It was determined that heavy rains following spraying carried the herbicide into the vicinity of the trees.

81-3479. Sullivan, T. P.; Sullivan, D. S. (Northwest Ecol. Anim. Res. Ltd., Langley, British Columbia V3S 4R1, Canada) **Responses of a deer mouse population to a forest herbicide application: reproduction, growth, and survival.** *Can. J. Zool.* 59(6): 1148-1154; 1981 (20 references).

This study was designed to monitor some of the demographic responses of a deer mouse population to a forest application of Roundup (glyphosate) herbicide. Populations of *Peromyscus maniculatus* were livetrapped from July 1978 to November 1980 in a control area and in an herbicide-treated 20-yr-old Douglas-fir plantation at Maple Ridge, British Columbia. The herbicide had no apparent adverse effects on reproduction, growth, or survival of deer mice 1 yr after treatment. Inconsistencies in growth rates and juvenile survival between control and experimental deer mice in 1980 could be due to the herbicide or demographic factors. Field dose applications of this herbicide should not have a direct effect on the dynamics of deer mouse populations. (Author abstract by permission)

81-3480. Ballhorn, L.; Rozman, T.; Rozman, K.; Korte, F.; Greim, H. (Inst. Okol. Chem. & Abt. Toxicol., Ges. Strahlen- & Umweltforschung mbH, Meunchen, D-8042 Neuherberg, BRD) **Cholestyramine enhances fecal elimination of pentachlorophenol in rhesus monkeys.** *Chemosphere* 10(8): 877-888; 1981 (18 references).

Rhesus monkeys treated with the pesticide pentachlorophenol (PCP) were fed diets containing cholestyramine to determine possible effects of this compound on fecal elimination of PCP. Monkeys were administered a single oral dose of 30 or 50 mg ^{14}C-labeled PCP/kg body wt and fed normal diet (controls) or diet containing 4% cholestyramine. Urine and feces were collected daily. Excretion of PCP and/or metabolites was determined by scintillation counting. Over a 6-day period, fecal elimination of PCP and/or metabolites increased up to 9-14-fold, while urinary excretion was reduced 2-6-fold.

81-3481. Seidenfeld, J. J.; Sobonya, R.; Wieden, M.; Toyoshima, J. (Dep. Int. Med., Arizona Health Sci. Cent., Univ. Arizona, Tucson, AZ) **Paraquat lung injury and infection.** *Chest* 80(3): 372; 1981.

To determine if bacterial infection may be a factor in the pulmonary inflammatory response to paraquat inhalation, rabbits were exposed in closed chambers to an aerosol of double distilled water (control), to 250 mg paraquat in double distilled water (PQ), or to the paraquat aerosol along with tetracycline in their drinking water (PQ/TCN). Animals were given 2 exposures of 1 hr each, spaced 7 days apart. Nasopharynx and lung cultures were performed at weekly intervals. Lung homogenate cultures were taken at sacrifice. The number of nasopharyngeal organisms cultured increased in PQ and PQ/TCN groups. A relationship was also seen between severity of lung pathology and number of organisms cultured and animals with positive cultures for the same organism on nasopharyngeal and lung homogenate cultures. It is suggested that there is a relationship between the pathologic severity

of pneumonitis and aerobic bacterial infection. (Presented at the 47th annual scientific assembly of the American College of Chest Physicians)

81-3482. McCarron, M. M.; Gaddis, G. P.; Trotter, A. T. (Los Angeles County/Univ. South. California Med. Cent., Los Angeles, CA 90033) **Acute yellow phosphorus poisoning from pesticide pastes.** *Clin. Toxicol.* 18(6): 693-711; 1981 (26 references).

Ten cases of ingestion of yellow phosphorus rat poison, including 4 cases that occurred during the past 3 yr, are reported. Comparison of these cases with 82 others from the literature showed that ingestion of yellow phosphorus paste often results in clinical findings that are different from those described for acute yellow phosphorus poisoning in current toxicology texts. The time lag between swallowing of the poison and onset of symptoms varied from a few minutes to 24 hr. Garlic odor, mucosal burns, and phosphorescent vomitus or feces occurred in only a small percentage of cases. Diarrhea was not a presenting complaint. Initial symptoms were referable to the gastrointestinal tract, central nervous system, or both. Mortality rates were 23% for patients who had early symptoms of vomiting or abdominal pain; 73% for those where the first manifestation of intoxication was restlessness, irritability, drowsiness, stupor, or coma; and 47% for patients who had a combination of these GI and CNS symptoms initially. Applying standard diagnostic criteria for yellow phosphorus poisoning to patients who have consumed yellow phosphorus pastes may result in serious diagnostic errors. (Author abstract by permission)

81-3483. Hilmy, A. M.; Shabana, M. B.; Saied, M. (Dep. Zool., Fac. Sci., Alexandria Univ., Alexandria, Egypt) **A comparative study of mercury poisoning on *Aphanius dispar* (Teleostei), *Sergestes lucens* (Crustacea) and *Modiolus modiolus* (Mollusca) of the Red Sea.** *Comp. Biochem. Physiol. C* 68(2): 199-204; 1981 (20 references).

Experimental organisms were treated with mercuric chloride solutions. Short-term as well as long-term bioassay studies were made. TLM and AF along with SCL were determined. Clinical and structural abnormalities observed during acute and sub-acute mercury poisoning were recorded. *Aphanius dispar* was most resistant; *Sergestes lucens* was most sensitive; intermediate in toxicity was *Modiolus modiolus*. Results obtained threw light on the prediction of levels of wastes that are safe under the conditions of continuous exposure which may be taken as a hypothetical goal. (Author abstract by permission, modified)

81-3484. Pant, S. C.; Kumar, S.; Khanna, S. S. (Kumaun Univ., Naini Tal 263002, India) **Toxicity of copper sulphate and zinc sulphate to fresh water teleost *Puntius conchonius* (Ham) in hard water.** *Comp. Physiol. Ecol.* 5(3): 146-149; 1980 (18 references).

Acute toxicity of zinc sulfate and copper sulfate to the fish *Puntius conchonius* was studied in static bioassays. Tests were carried out in hard water (hardness 310 mg/l as $CaCO_3$). The copper sulfate concentrations tested were 0.04-0.075%; zinc sulfate concentrations were 2.7-4.2%. The 48, 72, and 96-hr LC50 values for copper sulfate were 0.709, 0.646, and 0.571 mg/l, respectively. Zinc sulfate was much less toxic, with 48, 72, and 96-hr LC50 values of 39.52, 36.25, and 33.26 mg/l, respectively. A brief review is presented of previously published work on the toxicity of these metals to fish.

81-3485. Akino, T.; Ohno, K. (Dep. Biochem., Sapporo Med. Coll., Sapporo, Japan) **Phospholipids of the lung in normal, toxic, and diseased states.** *CRC Crit. Rev. Toxicol.* 9(3): 201-274; 1981 (580 references).

A review is presented in which lung phospholipids under a variety of conditions, including pesticide toxicity, are discussed. The physiological significance, characteristics, metabolism, and regulation of phospholipids are described. The effects of a variety of diseases and toxicants on phospholipids are outlined. Paraquat toxicity is given as an example of a broad-spectrum herbicide toxic to mammals. Symptoms are initial pulmonary edema followed by progressive interstitial fibrosis. Rats dosed with 30 mg/kg suffered lung collapse. Alveolar hemorrhage, epithelial proliferation, and atelectasis are also frequent results of paraquat poisoning. Production of the superoxide anion (O_2^-) leads to the development of lipid peroxides, and hence to cell death. Paraquat depresses activity of the pentose-phosphate pathway, reduces the level of NADPH, and inhibits fatty acid synthesis.

81-3486. Vasil'eva, T. I.; Savchenko, K. N.; Balashova, E. K.; Rozengart, V. I.; Sherstobitov, O. E.; Brestkin, A. P.; Bihreva, L. A.; Godovikov, N. N.; Abdullaev, N. B.; Abiyurov, B. D; Kabachnik, M. I. (A. N. Nesmeyanov Inst. Hetero-organic Compd., Acad. Sci. USSR, Mosrow, USSR) **Novye izbiratel'nye akaritsidy v ryadu tioetinil'nykh efirov tiofosfornykh i ditiofosfornykh kislot. [New selective acaricides in the series of thioethynyl esters of thiophosphoric and dithiophosphoric acids.]** *Dokl. Akad. Nauk SSSR* 259(2): 474-477; 1981 (5 references) (Russian).

The toxicity of selective insectoacaricides to mammals was determined in white mice. Results of determination of the antiesterase action of monothio derivatives are presented. Moderate toxicity was demonstrated. The absence of inhibition of brain acetylcholinesterase at lethal doses was evidence against an anticholinesterase mechanism of death in mice. Toxicity of dithio derivatives

did not differ from that of monothio derivatives, which is not characteristic of preparations with anticholinesterase action. LD50 values for mice are given for a series of compounds.

81-3487. Richter, E.; Luger, W.; Klein, W.; Korte, F.; Weger, N. (Pharmakol. Inst., Univ. Muenchen, D-8000 Munich, 2, BRD) **Excretion of β-hexachlorocyclohexane by the rat as influenced by oral paraffin, squalane, and Lutrol E 400.** *Ecotoxicol. Environ. Saf.* 5(3): 270-280; 1981 (28 references).

Rats were used in studies of the effects of several compounds on the excretion rate of β-HCH (β-BHC). Following the administration of 1.5 ppm β-HCH for 1 wk, rats were given 8% solution of either light liquid paraffin, squalane, or Lutrol E 400 for 8 wk. Paraffin and Lutrol E 400 significantly enhanced the elimination of β-HCH. Squalane affected elimination during the 1st 4 wk only. Although Lutrol reduced body wt gain, paraffin and squalane had no effect.

81-3488. Renner, G.; Herforth, B.; Gokel, J. M.; Goerz, G.; Luderschmidt, C. (Dep. Pharmacol., Univ. Munich, D-8000 Munich 2, BRD) **Subchronic toxicity studies on pentachloronitrosobenzene (PCNO) in female rats.** *Ecotoxicol. Environ. Saf.* 5(3): 281-290; 1981 (21 references).

Subchronic toxicity of PCNO, a metabolite of the soil fungicide PCNB (quintozene) and the effects of long-term skin exposure to PCNO were studied in rats. Female Sprague-Dawley rats were given PCNO in their diet at 0, 10, 50, or 100 ppm for 18 wk. General appearance and behavior were unaffected. Growth and food intake increased at all dosage rates. Ferri-hemoglobin showed a dose-related increase. Activities of cytochrome P-450 and GSH increased significantly at 100 ppm only. In another series of tests, 0.02 ml of PCNO solution (0, 4, 10, or 200 μg PCNB/dose) were applied to back skin of female rats for 18 wk. There was no indication that the compound irritated skin.

81-3489. Sastry, K. V.; Sharma, K. (Dep. Zool., Sch. Environ. Contam. & Toxicol., D.A.V. (P.G.) Coll., Muzaffarnagar, India) **Diazinon-induced histopathological and hematological alterations in a freshwater teleost, *Ophiocephalus punctatus*.** *Ecotoxicol. Environ. Saf.* 5(3): 329-340; 1981 (30 references).

The effects of diazinon on the tissues and blood of *Ophiocephalus punctatus* was investigated. Fish were exposed to 0.2 and 0.4 mg diazinon/l. Liver cord disarray, rupture of cell membranes, vacuolation in hepatocytes, and enlargement of the nuclei were noted after 15 days. After 30 days these changes became more severe, with the onset of fibrosis, degeneration of nuclei; and phagocytic invasion. Stomach and intestinal damage was slight. Shrinkage of the glomerular network and necrosis of proximal tubules were the most conspicuous changes in the kidneys. Hemoglobin, hematocrit, glucose, cholesterol, urea, sodium and calcium levels in the blood increased. The response of enzyme activity was variable.

81-3490. Heartlein, M. W.; DeMarini, D. M.; Katz, A. J.; Means, J. C.; Plewa, M. J.; Brockman, H. E. (Dep. Biol. Sci., Illinois State Univ., Normal, IL) **Mutagenicity of municipal water obtained from an agricultural area.** *Environ. Mutagenesis* 3(5): 519-530; 1981 (37 references).

Samples were taken of lake water from Lake Bloomington and Lake Evergreen, and of tap water from the Bloomington Water Treatment Plant. Tap water samples drawn in May were strongly mutagenic in TA100 in the presence of S-9 mix; a dose-response effect was noted. However, in the absence of S-9 mix, this sample was not mutagenic. The May lake water sample from Lake Bloomington was not mutagenic in TA100 either with or without S-9 mix. The May tap and lake water concentrated were not mutagenic in TA98 with or without S-9 mix. Drinking water from Bloomington Illinois collected from May through October 1979 was mutagenic in the *Salmonella*/microsome test. The May tap water concentrate was 60 times more mutagenic than the other concentrates in TA100 in the presence of S-9 mix. The difference between the May lake and May tap samples is probably due to the fact that the highly mutagenic May tap water concentrate was derived from purified Lake Evergreen water, but the weakly mutagenic May lake water concentrate was derived from Lake Bloomington. Unconcentrated samples of lake and tap water were not mutagenic in *Zea mays* (maize). There is a remote possibility that the mutagens detected in the concentrated water samples were preferentially mutagenic to the procaryote *Salmonella* and not to the eucaryote maize.

81-3491. Abidi, S. L.; Finch, R. A. (Natl. Fish. Res. Lab., US Fish & Wildl. Serv., La Crosse, WI) **Mutagenicity of isomeric β,γ-unsaturated *N*-nitrosamines derived from terpene alkanolamines.** *Environ. Mutagenesis* 3(5): 587-591; 1981 (6 references).

The results of an Ames *Salmonella*/microsome mutagenicity test performed on a mixture of *cis*- and *trans*-*N*-nitroso-2(3′,7′-dimethyl- 2′,6′-octadienyl)amino-ethanols are presented. A mixture of the isomers in a ratio of 1:2 (*cis:trans*) is sold commercially as GD-174 and used as a selective fish toxicant for controlling carp populations. The sample was tested at dose levels of 50, 100, and 250 μg incubation mixture, with and without an Aroclor 1254-induced rat liver S-9 activation system. The test material did not induce a significant increase in the total number of revertant colonies/plate in any of the tester strains. No

dose-response relationship was noted. An examination of the background lawn of bacterial growth in these cultures indicated a cytotoxic effect of the test material at dose levels of 100 and 250 μg/incubation mixture and a slight cytotoxic effect at 50 μg/incubation mixture. The mixture of the *cis* and *trans* isomers was mutagenic for the *Salmonella* tester strains TA100 and TA1535 in the presence of the S-9 activation system.

81-3492. Usmanov, I. A.; Takhirov, M. T. (Inst. Sanit. Hyg. & Occup. Dis., Tashkent, USSR) **Giginicheskoe normirovanie trikhodermina v vozdukhe rabochei zony. [Hygienic standardization of trichodermin in the air of a work zone.]** *Gig. Tr. Prof. Zabol.* (7): 54; 1981 (Russian).

Trichodermin is a fungicide that is effective against diseases of the cotton plant. Tests in mice and rats showed that trichodermin has low toxicity. In order to establish a harmless level of air pollution on industrial premises, a threshold of allergenic action of the preparation after 4 mo of inhalation was determined in guinea pigs. On the basis of results, a maximum permissible concentration of 0.1 mg/m³ with a coefficient of safety of 10 was recommended.

81-3493. Bider, J. R.; Brancher, G. A. (Dep. Renewable Resour., McDonald Campus, McGill Univ., Ste. Anne de Bellevue, Quebec H9X 1CO, Canada) **Effet d'une pulverisation experimentale d'aminocarb (Matacil 1.4 OSC) sur l'activite des populations animales terrestres. Report final. [The effect of an experimental application of aminocarb (Matacil 1.4 OSC) on the activity of a forest animal community. Final report.]** Government of Quebec, Ministry of Energy & Resources Report: 113 pp.; 1980 (10 references) (Multilingual).

An experimental plot of forest land was treated with aminocarb at 0.175 kg AI/ha. The sand transect technique was used to measure the effects of the treatment of 41 species or groups of species. Immediately following spraying there was decreased activity among Arachnid and Lepidopteran species, and an increase in bird activity on the ground. This change lasted for 3 wk. A significant increase in weasel activity was noted 5 days after spraying, which may have been a result of increased bird activity on the ground. Toads were the only amphibians which appeared to have been affected by the spray. Gartner snakes, predators of toads, were affected either through the insect-toad food chain or by the lower activity of the toads. In spite of these minor changes there did not appear to be any evidence that a spraying program with this chemical would have a deleterious effect on the forest community. This report is published in French and English.

81-3494. Matsushita, T.; Aoyama, K. (Dep. Hyg., Fac. Med., Kagoshima Univ., 1208-1, Usuki-cho, Kagoshima 890, Japan) **Cross reactions between some pesticides and the fungicide benomyl in contact allergy.** *Ind. Health* 19(2): 77-83; 1981 (17 references).

An animal experiment and a field study were designed in order to clarify the cross sensitivity between the fungicide benomyl and various other pesticides. In the field study, farmers from areas where a variety of pesticides are used were patch-tested for benomyl, interviewed, and subjected to various medical and biochemical examinations (liver function and blood tests urinalysis). Farmers from areas where benomyl had been used were compared with farmers from areas where benomyl had not been used; significant differences were noted in the benomyl patch testing. The highest incidence (41%) of positive patch test reaction was among female farmers who had used benomyl; 20% of female farmers who had not used benomyl showed positive reactions. Patch testing indicated cross reactions between benomyl and the pesticides diazinon, Saturn (benthiocarb; thiobencarb), Daconil (chlorthalonil), and Z-Bordeaux (Bordeaux mixture). In the guinea pig maximization test, cross reactions occurred between benomyl and the pesticides diazinon, Kitazin P (IBP), Daconil, and Z-Bordeaux.

81-3495. Singh, O. P.; Rawat, R. R. (Dep. Entomol., Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh 482004, India) **Note on the safety of some insecticides for *Diaeretus rapae* M'Intosh, a parasite of the mustard aphid.** *Indian J. Agric. Sci.* 51(3): 204-205; 1981 (6 references).

A field experiment was conducted at Jabalpur to test the toxicity of common insecticides to the non-target insect *Diabertus rapae*, a parasite of mustard aphid; treatments were replicated 4 times in 5-row plots of Indian mustard plants. Thirteen insecticides previously found to be safe were sprayed at their recommended concentrations with a hand compression sprayer on the plants at the flowering-cum-podding stage; at this stage, there were 23-130 aphids and 5-19 parasitized aphid mummies/10 cm twig. The insecticides used included quinalphos, vamidothion, dicrotophos, dimethoate, methyl demeton, malathion, phosalone, endosulfan, monocrotophos, phoxim, methamidiphos (Tamaron 500), methamidophos (Monitor 50 EC), and fenvalerate. All insecticide treatments gave 100% aphid mortality. Phosalone and methamidophos (Tamaron) were significantly more safe for *D. rapae* than the other insecticides; with these 2 agents, levels of 95.55 and 100% emergence of adult parasites from the aphid mummies were recorded respectively. Moderately toxic insecticides included vamidothion, phoxim, dicrotophos, methamidophos, and monocrotophos. Very toxic insecticides included malathion, fenvalerate, quinalphos, endosulfan and methyl demeton. Dimethoate was a highly toxic insecticide.

81-3496. Dalela, R. C.; Bansal, S. K.; Gupta, A. K.; Verma, S. R. (Pollut. Relevant Res. Lab., Postgrad. Dep.

Zool., DAV Coll., Muzaffarnagar 251001, India) **Short-term stress on the oxygen consumption of a fresh water teleost *Saccobranchus fossilis*, following lethal and sublethal levels of chlordane, Metasystox and Sevin.** *Int. J. Environ. Stud.* 15(3): 229-235; 1980 (26 references).

Freshwater fish *(Saccobranchus fossilis)* were exposed to different concentrations of chlordane, Metasystox (methyl demeton), and Sevin (carbaryl) while routine oxygen consumption was determined in 6 continuous flow respirometers. Three well-marked phases of toxicity were noted: sensitization (fish sense toxic environment), response (fish exhibit hyperactivity), and normalization (fish become acclimated to the contaminated environment). The pesticides elevated or depressed oxygen consumption, in each case the result of abnormal patterns of hyperactivity. Oxygen uptake data show a critical threshold time for hyperactive response: 8-36 hr for chlordane, 0-4 hr for Metasystox, and 4-10 hr for Sevin. At TL50 dose, an all or nothing response was noted; once initiated the response was irreversible. It is not known whether the hyperactivity is due to toxicant action on sensory fibers, or directly on motor nerves or brain centers.

81-3497. Upadhyaya, A.; Rao, K. S. (Sch. Stud. Zool., Vikram Univ., Ujjain 456010, India) **Acute toxicity of Tafazine to fish.** *Int. J. Environ. Stud.* 15(3): 236-238; 1980 (9 references).

Three species of freshwater fish, *Tilapia mossambica, Punctius ticto,* and *Heteropneustes fossilis,* were exposed to Tafazine (simazine) at 1, 5 or 10 ppm. In *P. ticto,* simazine at 10 ppm caused death in about 10 days. In *H. fossilis,* 10 ppm caused death in 19 days. Opercular beats per minute, denoting hyperactivity, increased with increasing concentration in *T. mossambica* and *H. fossilis.* In *P. ticto,* the activity was higher at the first 2 concentrations. It was concluded that Tafazine was most toxic to *T. mossambica.* The hyperactivity noted in this study may have been due to herbicide toxicity to the respiratory system. Safe Tafazine concentration limits are proposed: 0.1 ppm for *T. mossambica* and *P. ticto,* and 1 ppm for *H. fossilis.*

81-3498. Belasco, I. J.; Harvey, J., Jr. (Exp. Stn., Biochem. Dep., E. I. du Pont de Nemours & Co. Inc., Wilmington, DE 19898) ***In vitro* rumen metabolism of ^{14}C-labeled oxamyl and selected metabolites of oxamyl.** *J. Agric. Food Chem.* 28(4): 689-692; 1980 (4 references).

The metabolism of radiolabeled oxamyl, methyl *N′,N′*-dimethyl- *N*-dimethyl-*N*- [(methylcarbamoyl) oxy]-1-thiooxamimidate- 1-^{14}C, by rumen microorganisms, *in vitro,* was rapid. Essentially all (99%) of the oxamyl had been metabolized within 6 hr. The major metabolites after 24 hr of incubation were methyl *N*-hydroxy-*N′, N′*-dimethyl- 1-thiooxamimidate and *N,N*-dimethyl- 1-cyanoformamide (DMCF), which accounted for 80% of the residual radioactivity. Separately, the *in vitro* rumen metabolism of metabolite A, the glucose conjugate of methyl *N*-hydroxy-*N′, N′*-dimethyl- 1-thiooxamimidate, yielded DMCF. In turn, DMCF was found to metabolize to *N,N*-dimethyloxamide, *N,N*-dimethyloxamic acid, and *N*-methyloxamic acid. All the metabolites isolated and characterized, except for *N,N*-dimethyloxamide, were identical with those previously demonstrated in the rat. (Author abstract reprinted by permission of the American Chemical Society)

81-3499. Draughon, F. A.; Ayres, J. C. (Dep. Food Technol. & Sci., Univ. Tennessee, Knoxville, TN 37901) **Insecticide inhibition of growth and patulin production in *Penicillium expansum, Penicillium urticae, Aspergillus clavatus, Aspergillus terreus,* and *Byssochlamys nivea.*** *J. Agric. Food Chem.* 28(6): 1115-1117; 1980 (17 references).

Since patulin is produced by a wide variety of fungi under natural conditions, experiments were undertaken to determine if the inhibition of naled, Sevin (carbaryl) pyrethrum, and methoxychlor was species-dependent, and if the breakdown products of naled were active inhibitors of patulin production. At 100 ppm, naled completely inhibited patulin production and growth by the fungi *Penicillium expansum, Penicillium urticae* NRRL 1952, *Penicillium urticae* NRRL 994, *Byssochlamys nivea, Aspergillus clavatus,* and *Aspergillus terreus.* Sevin (100 ppm) inhibited patulin production by 16.6, 80.3, 100, 81.7, 31.5, and 89.5%, respectively, by these fungi. Pyrethrum (100 ppm) inhibited production of patulin in these fungi by 33.3, 1.2, 59.4, 34.9, 59.2, and 90.9%, respectively. Methoxychlor did not significantly inhibit patulin production. Six breakdown products of naled were important contributors to the effectiveness of naled as an inhibitor of patulin production. (Author abstract reprinted by permission of the American Chemical Society)

81-3500. Chin, B. H.; Tallant, M. J.; Duane, W. C.; Sullivan, L. J. (Dep. Saf. Assess., T. R. Evans Res. Cent., Diamond Shamrock Corp., Painesville, OH 44077) **Anticholinesterase effects of carbamate insecticide thiofanox and its metabolites in rats.** *J. Agric. Food Chem.* 28(6): 1327-1330; 1980 (13 references).

The anticholinesterase activity of the carbamate insecticide thiofanox (P), 3,3-dimethyl-1- (methylthio)-2-butanone *O*-[(methylamino) carbonyl]oxime, and its 3 metabolites 3,3-dimethyl-1- (methylsulfinyl) -2-butanone *O*-[(methylamino) carbonyl]oxime (P_1), 3,3-dimethyl-1-(methylsulfonyl) -2-butanone *O*-[(methylamino) carbonyl]oxime (P_2), and 3,3-dimethyl-1-(methylsulfonyl)-2-butanone *O*-[(hydroxymethylamino) carbonyl]oxime (P_2OH) was investigated in the rat. The relative order of potency was $P_2 > P_1 > P > P_2OH$ for both the plasma ChE and RBC ChE. Time-dependent studies with P showed that maximum observed inhibition of cholinesterase (ChE) ac-

tivity of plasma and red blood cells (RBC) of the rat was attained at 30 min after the peroral administration of 1 mg/kg P in aqueous solution. The maximum depression of brain ChE activity was observed 1-2 hr postdose. In all 3 tissues, complete recovery of ChE activity was attained at 24 hr after administration. (Author abstract reprinted by permission of the American Chemical Society)

81-3501. Hansen, L. G.; Washko, P. W.; Tuinstra, L. G. M. T.; Dorn, S. B.; Hinesly, T. D. (Dep. Vet. Biosci., Univ. Illinois, Urbana, IL 61801) **Polychlorinated biphenyl, pesticide, and heavy metal residues in swine foraging on sewage sludge amended soils.** *J. Agric. Food Chem.* 29(5): 1012-1017; 1981 (36 references).

Berkshire sows were overwintered for 2 seasons on experimental plots which had received various applications of Chicago sewage sludge for the 8 preceding years. Cadmium was the only element analyzed which accumulated significantly in tissues; all 3 levels of treatment were adequate to induce small amounts of Cd binding protein in livers and kidneys. Polychlorinated biphenyls and *p,p'*-DDE accumulated in the fat of the sows in a dose-related manner. Individual chlorobiphenyls were analyzed, and the results indicate that estimation of Aroclor content by measuring selected peaks results in misleading information. (Author abstract by permission)

81-3502. Kraybill, H. F. (NCI, Bethesda, MD 20205) **Carcinogenesis of synthetic organic chemicals in drinking water.** *J. Am. Water Works Assoc.* 73(7): 370-372; 1981 (9 references).

Of 2221 organic contaminants detected worldwide in both raw and treated water, 765 have been found in drinking water. Of these, 20 were recognized carcinogens, 23 were suspected carcinogens, 18 were carcinogenic promoters, and 56 were mutagens. Concentrates of water prepared by reverse osmosis and final treatment by lyophilization have been tested in bacterial systems and cell cultures; some mutagenic activity was shown in these test systems. A series of epidemiologic studies suggest that the risk of exposure to carcinogenic substances may be greater from exposure to surface water compared to groundwater; chlorinated water compared to nonchlorinated water; water with high trihalomethanes or nonchloroform trihalomethane levels compared to low trihalomethane or nonchloroform trihalomethane levels; and for highly polluted compared to nonpolluted water. Estimations of human lifetime cancer risk factors for carbon tetrachloride, chloroform, vinyl chloride, chlordane, dieldrin and PCB, calculated by mathematical extrapolation of animal data on known levels of carcinogens in drinking water, are presented in tabular form. Maximum observed levels in finished water for chlordane, dieldrin, and PCB were 0.1, 8, and 3 μg/l, respectively. Estimates of human lifetime cancer risk per μg/l were 1.8×10^{-4}, and 3.1×10^{-6}, respectively.

81-3503. Misra, H. P.; Gorsky, L. D. (Energy-Related Health Res., Univ. California, Davis, CA 95616) **Paraquat and NADPH-dependent lipid peroxidation in lung microsomes.** *J. Biol. Chem.* 256(19): 9994-9998; 1981 (59 references).

Studies were conducted to determine the effects of paraquat on NADPH-dependent lipid peroxidation in lung microsomes. Bovine lung tissue was homogenized and centrifuged to separate the microsomal fraction, which was used for assay in tests to determine the effect of paraquat on microsomal lipid peroxidation. Microsomes were incubated with NADPH, which resulted in the formation of lipid peroxides. Paraquat inhibited the lipid peroxidation (50% inhibition by 4×10^{-5} *M* paraquat). Several other compounds also inhibited peroxidation (dimethylfuran, diphenylfuran, catalase); however, mannitol, benzoate, and ethanol had little effect. A mechanism involving the formation of reduced paraquat (which in turn reacts with O_2, thus diverting O_2 from the normal pathway) is presented as a means by which paraquat interferes with lipid peroxidation.

81-3504. Tooby, T. E.; Lucey, J.; Stott, B. (Min. Agric., Fish. & Food, Burnham-on-Crouch, Essex, CMO SHA England) **The tolerance of grass carp, *Ctenopharyngodon idella* Val. to aquatic herbicides.** *J. Fish Biol.* 16(5): 591-597; 1980 (19 references).

The acute toxicity of 10 aquatic herbicides (asulam, Cyanatryn, 2,4-D, dalapon, dichlobenil, diquat, diuron, glyphosate, paraquat, and terbutryne) to the herbivorous grass carp *Ctenopharyngodon idella* was determined. After acclimatization to aquaria, fish were exposed to a range of concentrations of each herbicide. Mortality and loss of swimming equilibrium were recorded, and LC50 values determined for exposures of 24, 48, and 96 hr. The 96-hr LC50s ranged from 5.8 mg/l for terbutryne to > 30,000 mg/l for dalapon. Safety factors were calculated as the ratio between the 96-hr LC50 and the maximum concentration of herbicide formulation likely to be found in water after use at the recommended level. Paraquat and dichlobenil had the smallest safety factors (13 and 9, respectively). It is concluded that the maximum herbicide concentration likely to be found in water should cause little harm to fish. The possible inhibition of feeding at lower concentrations is suggested.

81-3505. Wren, C.; Carson, P. H. M.; Sanderson, J. M. (Reg. Cardiac Unit, Papworth Hosp., Cambridge CB3 8RE, England) **Organophosphate poisoning and complete heart block.** *J. R. Soc. Med.* 74(9): 688; 1981.

A case is described of a dairy farmer suffering a complete heart block following use of an organophosphosate insecticide [Ruerene *(sic)*; Ruelene; crufomate]. Initial symptoms included breathlessness, aching legs, and weakness, which disappeared upon avoidance of the

chemical. Symptoms recurred following a re-exposure. A third exposure (accidental touching of an opened can of Ruerene) resulted in a blackout. Similar attacks occurred, and after a diagnosis of heart block, a permanent pacemaker was implanted.

81-3506. Coyle, V. (Fac. Vet. Sci., Univ. Queensland, Brisbane 4067, Queensland, Australia) **Diagnosis and treatment of thallium toxicosis in a dog.** *J. Small Anim. Pract.* 21(7): 391-397; 1980 (14 references).

Chronic thallium poisoning in a Samoyed × Border collie dog is reported. When first seen by a veterinarian, the dog was emaciated and had a history of conjunctivitis, dyspnea, anorexia, emesis, tenesmus, arching of back, and stiffness of the hind legs. Urine analyses were negative for thallium; however, on the 44th day of hospitalization, a 24-hr post-potassium chloride infusion sample was positive, confirming thallium poisoning. Complete recovery occurred by day 239. Supportive drug therapy only was used, since it was feared that specific treatment, such as the administration of dithizone or prussian blue, would further mobilize the thallium in the blood stream and increase the clinical toxicity. The usefulness of potassium chloride in increasing urine levels of thallium for diagnosis is discussed.

81-3507. Morgan, A. A. (37 Holcombe Rd., Ilford, Essex IG1 4XF, England) **Cholinesterase problems arising in a plant manufacturing tri-aryl phosphates.** *J. Soc. Occup. Med.* 31(3): 119-122; 1981 (11 references).

Eight case reports are presented of individuals employed in a plant which manufactured tri-aryl phosphates. These individuals suffered abnormal cholinesterase levels. Case 1 fell into subgroup U_1 according to the grouping of Harris and Whittaker; it was judged safe for this individual to be working with organophosphate compounds. Case 2 most likely also fell into the heterozygous fluoride resistant group (U_1), and could safely work around organophosphates. Cases 3 and 4 were categorized in the intermediate group, with a reduced cholinesterase activity. More frequent estimation of cholinesterase was recommended to observe any progressive decline. No other action for such employees is deemed necessary for safety. The remaining cases (5, 6, 7, and 8) exhibited progressive reduction in esterase activity. Case 7 demonstrated a severe decline in the cholinesterase level. A remarkably low initial pre-employment cholinesterase level was noted in case 8.

81-3508. Smith, E. N.; Carlson, G. P. (Dep. Pharmacol. & Toxicol., Sch. Pharm. & Pharm. Sci., Purdue Univ., West Lafayette, IN 47907) **Various pharmacokinetic parameters in relation to enzyme-inducing abilities of 1,2,4-trichlorobenzene and 1,2,4-tribromobenzene.** *J. Toxicol. Environ. Health* 6(4): 737-749; 1980 (16 references).

Experiments were designed to investigate the enzyme-inducing abilities of 1,2,4-trichlorobenzene (TCB) and 1,2,4-tribromobenzene (TBB). Male rats were fed either TBB or TCB at 1 mmol/kg/day for 7 days. Urine and feces were analyzed during the study. Animals were sacrificed at various intervals to determine the effects on enzyme induction. The effects of starvation and phenobarbital on the inductive effects of TCB and TBB were determined. Induction of cytochrome P-450 and NADPH-cytochrome-c-reductase was observed. TCB and TBB were retained primarily in body fat. More TBB was retained than TCB, which corresponds with the observation that more TCB was excreted than TBB. TBB leads to higher levels of induction than does TCB. Starvation or phenobarbital treatment, which alter patterns of TCB and TBB storage in fat, change the rate of decline of enzyme induction.

81-3509. Fujimori, K.; Ho, I. K.; Mehendale, H. M. (Dep. Pharmacol. & Toxicol., Med. Cent., Univ. Mississippi, Jackson, MI) **Assessment of photomirex toxicity in the mouse.** *J. Toxicol. Environ. Health* 6(4): 869-877; 1980 (14 references).

Male ICR mice were treated with photomirex. Effects on body temperature, body wt, fluid and food consumption, plasma glucose levels, fatty acid levels, brain biogenic amine levels, and cumulative mortality were observed. Toxicity was observed as a result of 10, 25, and 50 mg/kg/day doses. Mortality began to occur 4 days after doses of 50 mg/kg, 7 days after 25 mg/kg, and 16 days after 10 mg/kg were administered. The LD50 was estimated to be 225-250 mg/kg. Body wt loss was dose-dependent. Food consumption was increased by the 10 mg/kg dose; increased then decreased by the 25 mg/kg; and decreased by 50 mg/kg. Water intake was increased by 25 and 10 mg/kg doses. Body temperature was unaffected by photomirex, as were levels of plasma glucose, fatty acids, and brain biogenic amines. Photomirex appears to act similarly to its parent compound, mirex.

81-3510. Shamat, N. A.; Maier, W. J. (Univ. Minnesota, Minneapolis, MN) **Kinetics of biodegradation of chlorinated organics.** *J. Water Pollut. Control Fed.* 52(8): 2158-2167; 1980 (17 references).

The need for source control and treatment procedures to remove pollutants, including herbicides, from wastewaters is discussed. The feasibility of using activated sludge biomass to develop microbial populations capable of completely metabolizing chlorinated organic compounds has been investigated. In continuous-flow experiments in chemostat-type reactors, 4 major parameters were monitored routinely: pH, concentration of chlorinated compounds (UV absorbance), organic carbon concentration, and free chloride ion concentration. Lag time for each target substrate was determined from the

elapsed time between inoculation with mixed liquor suspended solids (MLSS) until a measurable decrease in substrate concentration was noted. A lag period of 10 days or longer was observed; it is attributed to the combined effects of low initial concentrations of active biomass and the nonavailability of enzyme systems for metabolizing the target substrate. The metabolized chlorinated compounds were transformed to cell mass, carbon dioxide, chloride ions, and water. Stable populations capable of breaking down chlorinated compounds have been maintained over an extended period of time in continuous-flow reactors using the target substrate as the only source of carbon and energy.

81-3511. Kubinski, H.; Gutzke, G. E.; Kubinski, Z. O. (Div. Neurosurg., Univ. Wisconsin, Madison, WI 53706) **DNA-cell-binding (DCB) assay for suspected carcinogens and mutagens.** *Mutat. Res.* 89(2): 95-136; 1981 (44 references).

The DNA-cell-binding (DCB) assay for screening potential carcinogens and mutagens is described. In tests on nearly 280 chemicals (including 130 of known carcinogenic potential) the DCB assay results agreed with animal assays in about 96% of the cases. The DCB technique was superior to other tests that measure the formation of macromolecular complexes and was recommended for use alone or with other rapid carcinogen detection tests for the screening of insecticides, herbicides and various industrial and environmental chemicals.

81-3512. de Neef, J. H.; Porsius, A. J. (Dep. Pharm., Div. Pharmacother., Univ. Amsterdam, NL-1018 TV Amsterdam, The Netherlands) **Central effects of paraoxon on haemodynamics in the cat.** *Naunyn-Schmiedebergs Arch. Pharmacol.* 317(2): 168-172; 1981 (26 references).

Application of paraoxon into the left vertebral artery (8-80 μg) or both the left and right vertebral artery (4-8 μg) of the anesthetized cat evoked dose-dependent depressor effects, whereas heart rate was not influenced significantly. Also after systemic administration of paraoxon (150-825 μg/kg), while peripheral muscarinic receptors were blocked, depressor effects were still observed. Dose-response curves for the depressor response to paraoxon were established. Infusion of low doses of dexetimide via the vertebral artery prevented the hypotensive action of paraoxon. The distribution of this antimuscarinic drug in the brain was investigated. The depressor effect of paraoxon can be attributed to both a decrease in peripheral resistance and cardiac output. Decerebration and midcollicular transection were carried out in order to elucidate the site and mechanism of action. The depressor effect of paraoxon seems to be mediated by a central mechanism of action located within the lower brain stem. It is concluded that stimulation of muscarinic receptors in the pontomedullary region gives rise to the observed changes in hemodynamic parameters. Muscarinic receptors in the hypothalamus seem to be of minor importance for the hypotensive action of paraoxon. (Author abstract by permission)

81-3513. Hwang, E. C.; Plaitakis, A.; Magnussen, I.; Van Woert, M. H. (Dep. Neurol., Mount Sinai Sch. Med., New York, NY 10029) **Relationship of inferior olive-climbing fibers to *p,p'*-DDT-induced myoclonus in rats.** *Neurosci. Lett.* 24(1): 103-108; 1981 (20 references).

Male Sprague-Dawley rats were given *p,p'*-DDT (150-300 mg/kg) in olive oil ig using an 18-gauge animal feeding needle. The inferior olive was destroyed by pretreatment of rats with 3-acetylpyridine (3-AP) injection at 80 mg/kg ip. DDT (300 mg/kg) given to 3-AP treated rats decreased the latency to the onset of myoclonus, typically ~ 3.5 hr, to 1.5 hr. Harmaline administration (20 mg/kg ip) selectively increased the firing rate of climbing fibers and produced intermittent tremors that are easily distinguished from stimulus-sensitive, jerking myoclonic movements. Simultaneous administration of 20 mg/kg harmaline with 150 mg/kg DDT significantly delayed the onset of myoclonus. In addition, only 5% mortality was noted in the harmaline-treated group compared to 35% mortality in the controls. In control animals L-5 hydroxytryptophan (L-5-HPT) (100 mg/kg) plus chlorimipramine (10 mg/kg), clonazepam (2 mg/kg), and phenoxybenzamine (20 mg/kg) reduced myoclonus by 51%, 60%, and 77%, respectively. In 3-AP-pretreated rats, L-5-HTP-plus-chlorimipramine, clonazepam, and phenoxybenzamine had no significant effect on the myoclonus produced by DDT. Phenoxybenzamine significantly aggravated DDT myoclonus in rats pretreated with 3-AP.

81-3514. Matsushita, T.; Aoyama, K. (Dep. Public Health, Sch. Med., Kagoshima Univ., Kagoshima, Japan) **[Cross contact reactions in skin sensitivity to agricultural agents.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 35(1): 171; 1980 (Japanese).

The phenomenon of cross contact reactions in skin that is exposed to various agricultural chemicals was investigated with respect to representative chemicals via epidemiological and animal studies. Testpflaster was pasted on in a closed patch distribution for 24 hr on 94 workers who did not use benomyl in culturing vegetables, and the cross contact reactions were observed. Cross contact responses between primary pesticides and benomyl, captafol, or Daconil (chlorthalonil) were tested on female Hartley strain guinea pigs treated with closed patches of Testpflaster for 24 hr, followed by applications of the primary pesticide for 2, 24, and 48 hr. The mean responses were calculated from the 2, 24, and 48 hr readings for reactivity. Cross reactivity was observed in 1 of 12 men and 17 of 82 women given Testpflaster applications of benomyl; subjects who used Daconil, Kelthane (dicofol), Kitazin P

(IBP), Supracide (methidathion), paraquat, or Bordeaux mixture had especially high incidences of positive reactions, indicating cross contact reactivities of these substances with benomyl. In the animal experiments, moderate or mild cross contact reactions were observed between benomyl and diazinon, Kitazin P, Daconil, paraquat, Bordeaux mixture, and others; strong cross contact reactions were observed between captafol and Daconil, Kelthane, Bordeaux mixture, and other agents; strong cross contact reactions were observed between Daconil and Bordeaux mixture, and moderate cross reactions were observed between Daconil and fenitrothion, Kelthane, and other agents. Although contact dermatitis may not be observed for individual pesticides, care should be taken to prevent contact with the pesticides, as cross contact reactions can occur.

81-3515. Oshima, H.; Nishimura, H.; Nishimura, T. (Dep. Public Health, Aichi Med. Univ., Nagoya, Japan) **[Experimental research on the toxicity of PCP.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 35(1): 173; 1980 (Japanese).

To study the mechanism of action of pentachlorophenol (PCP), sub-acute toxicity experiments were performed in Wistar rats. The LD50 of PCP was determined by the Behrens-Korber method. The rats were administered PCP po at 0, 40, 80, or 160 mg/kg body wt (all rats ~ 160 g) 2 times/wk for 1 mo. The rats were sacrificed by cervical dislocation, and blood was collected. Urine samples were collected on the day prior to sacrifice. The animals were examined histochemically and pathologically. The rats given PCP at 160 mg/kg showed significant ($p < 0.01$) retardation of wt gain compared with controls. Significant changes were observed in the weight of the liver in rats given 40 mg/kg, of the left adrenal gland in rats given 80 mg/kg, and of the right adrenal gland in rats given 160 mg/kg. Significant increases in blood cholesterol levels were observed in the rats given 80 or 160 mg/kg, and blood sugar levels were significantly increased in the rats given 160 mg/kg. A significant decrease in the pH of the urine was observed in the rats given 80 or 160 mg/kg. Histochemical studies using PAS stain showed that PCP decreased the amount of glycogen stored in the liver.

81-3516. Minagawa, O.; Takizawa, Y. (Dep. Public Hyg., Akita Univ. Sch. Med., Akita, Japan) **[Influence of intestinal absorption and internal body distribution of carbaryl, dieldrin, and paraquat on protein nutrition.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 35(1): 176; 1980 (Japanese).

The effects of a fixed protein diet on the digestive tract absorption and body distribution of the agricultural chemicals carbaryl (C), dieldrin (D), and paraquat (P) were examined in male Sprague Dawley rats fed normal commercial (25% protein; N), low (5%) protein (L), or high (40%) protein (H) diets. After ~ 10 wk of feeding, the rats were fasted for 15 hr and given the chemicals po under mild anesthesia: 5 mg C (10 μCi)/ml corn oil/kg body wt, 0.46 mg D (10 μCi)/ml corn oil/kg; or 0.46 mg P (10 μCi)/ml water/kg. Measurements were performed with a liquid scintillation counter. The absorption rates for the normal and low-protein diet rats were D > C > P, and for the H diet C > D > P. Distribution of C was 60% in the cytosol of the cells of the small intestine of rats from all 3 diets; 40-50% of the D was in the cell nucleus and cell debris; ~ 50% of the P was distributed in the nucleus and cell debris. C and P were primarily accumulated in the kidneys of L rats, and D was found in the adipose tissues of the L rats. All 3 chemicals were thought to be strongly toxic to the rats fed the low-protein diet.

81-3517. Nishimura, H.; Nishimura, T.; Oshima, H. (Dept. Public Hyg., Aichi Med. Coll., Aichi, Japan) **[Effects of PCP on glucose metabolism.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 36(1): 443; 1981 (Japanese).

Biochemical experiments were performed to study the effects of PCP on sugar metabolism. PCP (10 or 120 mg) was administered po to male Wistar rats, and the rats were not fed thereafter. Effects of PCP on liver wt and cellular constituents, glycogen and glycolysis intermediates, and serum glucose and hematocrit were studied at 3, 24, and 48 hr. In the rats administered 120 mg of PCP, liver wt increased 24 and 48 hr after administration, DNA quantity decreased at 24 and 48 hr, and RNA quantity increased at 24 and 48 hr. No significant changes in blood lactate or blood pyruvate were seen after PCP administration, but a trend of increased liver lactate was observed, especially at 48 hr in the rats given 120 mg of PCP. Compared with controls, PCP treated rats showed a marked decrease in liver glycogen quantities immediately following administration of the PCP, but the levels increased at 24 and 48 hr. The serum glucose levels in PCP-treated rats continued to be high after administration of PCP, especially directly after administration. Hematocrit levels were significantly low at 3 hr after administration of 120 mg of PCP. PCP clearly had a significant effect on glycogen, but the mechanism of this effect is currently under study.

81-3518. Sugiyama, H.; Emori, T. (Seric. Exp. Stn., Yatabe Tsukuba, Ibaraki 305, Japan) **Pesticide residues of MEP, MPP and PAP in mulberry stumps and its effect on the silkworm (*Bombyx mori*, L.).** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(3): 423-425; 1980 (5 references).

The fifth instar larvae of a hybrid from Nichi 134 and Shi 135 silkworms were reared on the leaves of pesticide-treated mulberry stump. The pesticides used included MEP (fenitrothion), MPP (fenthion) and PAP (phenthoate). The bark, wood, and pith of the sprayed stumps were separated carefully at specific intervals after the application of the pesticides. Ten days after applica-

tion, a high concentration of MEP, MPP, and PAP remained in the bark of the mulberry stump. The amount of pesticide residue was less in proportion to the dilution applied. No residue was detected in pith in any case of MPP spraying. Residues of PAP were negligible when dilutions of 20 and 40 times were used. Silkworms were reared on mulberry leaves of the treated stumps without damage. The larvae did not show any typical symptoms of toxicity. Cocoon wt and cocoon shell wt were less in silkworms reared on MEP-treated stumps compared with those reared on untreated stumps. A significant difference in cocoon wt was noted between silkworms reared on the MEP or MPP treated leaves and those reared on control leaves.

81-3519. Kato, Y.; Maki, S.; Matano, O.; Goto, S. (Inst. Environ. Toxicol., Kodaira, Tokyo 187, Japan) **Transplacental bioaccumulation of organoarsenate in rat-fetal blood after ferric methanearsonate administration.** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(3): 427-430; 1980 (10 references).

Adult female Wistar Imamichi rats were divided into 2 groups. Group 1 was dosed orally on day 11 of gestation with 20 mg/kg of the fungicide, ferric methanearsonate (MAF), labeled with ^{14}C. The second group was similarly treated on day 19 of gestation. Whole-body autoradiography and radiometry were used periodically to evaluate the placental transfer of radiocarbon up to day 20 of gestation. Radiocarbon levels in the embryos equilibrated to maternal plasma levels within 3 days after dosing. However, a substantial bioaccumulation of the radiocarbon became evident in the matured fetuses 9 days after dosing. Transplacental accumulation was primarily dependent on the development of the fetuses, and only a slight difference in radiocarbon level was found between the 24-hr and the 9-day post-treatment fetuses. It appeared that the most important factor in deciding the fetal-body burden of a MAF-derived organoarsenate is the maternal plasma level present in the late gestational stages around parturition. The body-burden may be dependent on the development of the metabolic activity in the fetus to transform methanearsonic acid to dimethylarsinic acid (cacodylic acid).

81-3520. Unai, T. (Life Sci. Res. Inst., Kumiai Chem. Ind. Co., Kikugawa-cho, Ogasa, Shizuoka 439, Japan) **[Toxicological studies on the metabolism of the insecticides pyrethroids and rotenoids.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(3): 453-461; 1980 (23 references) (Japanese).

Eight ^{14}C-labeled permethrin preparations were used in studies of the metabolism of *trans*- and *cis*-permethrin in rats, cows, and insects. Permethrin isomers were rapidly metabolized both hydrolytically and oxidatively. The preferred sites for hydroxylation of the permethrin isomers differed according to species. Conjugation reactions of the metabolites also differed for each species. The mammals quickly eliminated the parent compound, free metabolites, and their conjugates. When the decamethrin ester group is cleaved, cyanide is released which is converted mainly to thiocyanate with a small amount of 2-iminothiazolidine-4-carboxylic acid. 2-*O*-Demethylation is established as a new detoxification mechanism. The reaction of rotenone and *d*-epirotenone with 1-3 equivalents of boron tribromide followed by recyclization of the E-ring led to the formation of all 4 stereoisomers of natural rotenone and its *O*-demethyl derivatives. Structure-biological activity relationships of 63 rotenone derivatives including 40 new ones are also studied. High potency appears associated with the presence of a specific ring system designated ABCD with the *cis*6aβ, 12a′-B/C ring juncture as in rotenone. Various types of modification of this juncture result in diminished potency.

81-3521. Makletsova, N. Yu.; Lanovoi, I. D. (Dep. Obstet. Gynecol., Ivano-Frankovsk Med. Inst., Ivano-Frankovsk, USSR) **Stan ginekologichnoi zakhvoryuvanosti u zhinok, profesiino kontaktuyuchikh z pestitsidom tsineb. [Status of gynecological morbidity of women with occupational contact with the pesticide zineb.]** *Pediatr. Akush. Ginekol.* (3): 60-61; 1981 (2 references) (Ukrainian).

Gynecological morbidity was studied in 210 women with occupational exposure to the pesticide zineb and in 115 controls. The incidence of cervical erosion, uterine inflammation, vaginal inflammation, inflammation of the reproductive organs, menstrual cycle disorders, sterility, benign neoplasms of the genitalia, and prolapse of the reproductive organs was higher in women exposed to zineb (49% *vs* 156%). Incidences of these disorders were higher among women involved in operations such as packing.

81-3522. Mathur, S. P.; Belanger, A.; Hamilton, H. A.; Khan, S. U. (Chem. & Biol. Res. Inst., Res. Branch, Agric. Canada, Ottawa KLA 0C6, Canada) **Influence on microflora and persistence of field-applied disulfoton, permethrin and prometryne in an organic soil.** *Pedobiologia* 20(4): 237-242; 1980 (16 references).

Field studies were designed to determine the effect of insecticides disulfoton and permethrin and the herbicide prometryne on microbial activity in an organic soil. Disulfoton (2.24 kg/ha), permethrin (2.24 kg/ha), and prometryne (4.48 kg/ha) were applied to fields used for growing vegetables (lettuce and carrots). Soil samples were routinely taken for chemical and microflora analysis. After 4 wk, 85% of the disulfoton and 63% of the prometryne were dissipated. After 113 days, however, 65% of the permethrin was still in the soil. Slight inhibition of soil microbes occurred in the plots treated with permethrin. It was concluded that the changes in soil microbial activities and populations caused by the pesticides were not sustained and did not influence crop growth, except in the case of permethrin applied to carrots.

81-3523. Ahdaya, S. M.; Monroe, R. J. (Toxicol. Program, Dep. Entomol., North Carolina State Univ., Raleigh, NC 27650) **Absorption and distribution of intubated insecticides in fasted mice.** *Pestic. Biochem. Physiol.* 16(1): 38-46; 1981 (25 references).

The distribution of 11 insecticides including organophosphorus compounds, carbamates, and chlorinated hydrocarbons in fasted mice was studied. The mice were fasted for 12 hr prior to intubation of 1 mg/kg pesticide, including 1 μCi of labeled compound. They were killed at different time intervals, and the amount of radioactivity in the gut and selected organs was determined. The T-0.5 values of penetration were determined. Carbamates penetrated most rapidly (T-0.5 = 8-17 min). Organophosphorus compound T-0.5 values ranged from 24 to 78 min, and chlorinated hydrocarbons ranged from 15 to 62 min. All the pesticides were rapidly transported to tissues and organs; however, there as no consistent correlation between rate of absorption of the compounds and physicochemical properties.

81-3524. Tschaplinski, P. J.; Gardner, D. R. (Dep. Biol. & Inst. Biochem., Carleton Univ., Ottawa, Ontario K1S 5B6, Canada) **Metabolism of fenitrothion in red-backed voles (*Clethrionomys gapperi*).** *Pestic. Biochem. Physiol.* 16(1): 47-62; 1981 (54 references).

Studies were conducted to determine the nature of fenitrothion metabolism in voles. This information is of interest since fenitrothion is used to control spruce budworm in forests, where the vole is a non-target organism. A dose of from 1-75 μl of solvent-free analytical grade fenitrothion was injected (ip) into test animals. Excreta were collected and analyzed by gas chromatography. Animals were observed for toxic effects of the pesticide, and mortality rates were used to calculate LD50 values. The 96-hr LD50 value was 1330 mg/kg. The pesticide was rapidly metabolized and excreted, and did not accumulate in the body. The rapid metabolism and removal of fenitrothion in voles may explain its low toxicity. Cleavage at the P-O-aryl and P-O-alkyl bonds appears to be the mechanism of metabolic detoxification.

81-3525. Limcumpao, J. A.; Esguerra, V. C. (Vet. Ext. Off., Coll. Vet. Med., Univ. Phillipines, Quezon City, The Phillipines) **Studies on changes in serum cholinesterase activity in dichlorvos poisoning and its treatment in dogs.** *Philipp. J. Vet. Med.* 18(2): 94-116; 1980 (33 references).

Studies were conducted to determine the effects of dichlorvos on serum cholinesterase activity in dogs. The animals were dosed with 22 mg dichlorvos (95% technical grade)/kg. Serum cholinesterase activity was determined in the blood of poisoned dogs, controls, poisoned dogs undergoing treatment with atropine and/or 2-Pam Cl, and in non-poisoned dogs receiving atropine or 2-Pam Cl. The enzyme activity of poisoned dogs was not related to the clinical signs of poisoning. Enzyme activity was depressed from 10-70%.

81-3526. Cheah, M. L.; Avault, J. W.; Graves, J. B. (Sch. For. & Wildl. Manage., Agric. Exp. Stn., Louisiana State Univ., Baton Rouge, LA 70803) **Acute toxicity of selected rice pesticides to crayfish *Procambarus clarkii*.** *Prog. Fish Cult.* 42(3): 169-172; 1980 (25 references).

An insecticide (metalkamate; bufencarb), 3 herbicides (propanil; molinate; 2,4-D), and 5 fungicides [Arasan 70-S Red (thiram), Vitavax-R (carboxin), Benlate 50 WP (benomyl), Kocide SD (copper hydroxide), and Captan 80 WP (captan)] frequently used in rice cultivation in Louisiana were tested for their static acute toxicities to juvenile crayfish. To determine 96-hr LC50 values, test animals were placed in jars containing serial dilutions of stock pesticide solutions. Mortality was determined every 24 hr. Metalkamate showed a 96-hr LD50 of 0.28 mg/l. By comparison, previously reported 96-hr LC50 values for methyl parathion and malathion are 0.003 and 50 mg/l, respectively. Other 96-hr LC50 values determined were: 7.9, 14, 1389, 4.3, 217, 1032, 2918, and 15,631 mg/l for propanil, molinate, 2,4-D, Arasan 70-S Red, Vitavax-R, Benlate 50 WP, Kocide SD, and Captan 80 WP, respectively. It is noted that while these values are not transferable to the field, they give a valid comparison of the relative toxicity of the pesticides tested.

81-3527. McCann, J. A.; Hitch, R. K. (Off. Pestic. Programs, US EPA, Beltsville, MD 20705) **Simazine toxicity to fingerling striped bass.** *Prog. Fish Cult.* 42(3): 180-181; 1980 (4 references).

Tests were designed in an attempt to resolve the differences in the reported toxicity of simazine to striped bass fingerlings. Fish were treated in 5-gal wide-mouth jars with simazine concentrations of 0, 7.8, 13, 22, 36, 60, 100, and 180 mg/l, prepared from the 80% WP formulation, Aquazine, using soft water. No fish died at 100 or 180 mg/l. A test of the effect of water hardness showed that 180 mg/l simazine in water with a hardness of 137 mg/l showed no mortality. Since no mortality occurred at 180 mg/l, a calculation was made of the confidence level associated with the estimation that the LC50 was > 180 mg/l. The one-tailed confidence level was determined to be 99.9%, lending high statistical assurance to the hypothesis that the LC50 of Aquazine to fingerling striped bass is > 180 mg/l in both hard and soft water. It is suggested that differences in observed mortality patterns may have been due to an additive in the formulation and/or differences in the handling of these sensitive fish.

81-3528. Fischer, G.; Woeltjen, H. H.; Schauer, A. (Pathol. Inst., Univ. Goettingen, D-3400 Goettingen,

BRD) Lungenschaeden durch Zytostatika und Paraquat. [Pulmonary damage caused by cytostatics and paraquat.] *Roentgen Bl.* 34(9): 331-337; 1981 (43 references) (German).

Pulmonary impairment and fibrosis induced by cytostatics (antibiotics, alkylating substances, and antimetabolites) administered as chemotherapeutics to control tumors, and also by paraquat, are discussed. Examination of pulmonary function enables early detection of damage. Radiological diagnosis is non-specific. Biopsy reveals characteristic histological patterns which, however, do not differentiate between paraquat, cytostatics or shock-induced damage because the mechanism of the process inducing the damage, while unknown, appears to be similar. One hypothesis attributes the effect to cyclical oxidation and reduction of the agents in cells inducing the formation of free oxygen radicals and peroxide anions destroying cell membranes, inactivating vital enzymes, and interfering with the proper functioning of cells. The various clinical symptoms and histological observations characterizing the onset of pulmonary impairment by the above agents are described.

81-3529. Schuster, R.; Erkelenz, I.; Romatowski, H. J. (Abt. Roentgendiagnostik, Med. Klin. & Poliklin., Med. Einrichtungen, Univ. Goettingen, D-3400 Goettingen, BRD) Fruehbild der Lungenfibrose nach Zytostatika und Paraquatintoxikation. [Early pattern of pulmonary fibrosis following administration of cytostatics and intoxication by paraquat.] *Roentgen Bl.* 34(9): 338-341; 1981 (12 references) (German).

Early patterns of pulmonary toxicity of the cytostatics Bleomycin, mitomycin, and Methotrexate, and the herbicide paraquat are described on the basis of case histories of human intoxications. The initial effect is the formation of alveolar and perivascular edemas followed by fibrosis. Lethal pulmonary fibrosis induced by mitomycin has a faster course of action than that induced by Bleomycin (3-4 wk). Radiological diagnosis does not permit differentiation between pulmonary fibrosis, lymphangioma or systemic lymphatic disease, only biopsy shows the difference. Paraquat intoxications are lethal when the plasma level reaches 1.3 mg/l 8 hr following intake; levels of 0.2 mg/l are nonlethal. Fibrosis is observable 10-14 days following paraquat intake.

81-3530. Hardell, L. (Dep. Oncol., Univ. Hosp., Umea, Sweden) Relation of soft-tissue sarcoma, malignant lymphoma and colon cancer to phenoxy acids, chlorophenols and other agents. *Scand. J. Work Environ. Health* 7(2): 119-130; 1981 (26 references).

The carcinogenicity of a variety of pesticides is discussed. Published data relating phenoxy acids or chlorophenols to soft tissue sarcoma and malignant lymphoma were analyzed to investigate the validity of the conclusions. Data on colon cancer were reviewed for comparison. The data indicate that exposure to phenoxy acids and chlorophenols are positively related to the incidence of the cancer discussed.

81-3531. Reuber, M. D. (11014 Swansfield Road, Columbia, MD 21044) The role of toxicity in the carcinogenicity of endosulfan. *Sci. Total Environ.* 20(1): 23-47; 1981 (35 references).

Two studies on the toxicity and carcinogenicity of endosulfan are discussed. Endosulfan is highly toxic to rats, particularly males. The principal observations in the toxicity study were interstitial fibrosis of the kidney, atrophy of the testes, polyarteritis, parathyroid hyperplasia, osteitis fibrosis of bone, and abscesses of the lung. These conditions are thought to interfere with not only the health of the animal, but also with the development of neoplasms. Carcinogenicity tests proved positive for this insecticide. Malignant neoplasms were induced in both male and female rats at all sites. It was also shown to cause neoplasms in the livers of mice. It is evident that acute and chronic effects should be examined when assessing the safety of a chemical. It can be seen by these studies that the toxic effect of a compound might sometimes prevent the development of tumors.

81-3532. Horn, S. (Author address not given) Effects of 2,4,5-T on chicks. *Search* 12(5): 97-98; 1981.

No significant behavioral effect was noted when 2,4,5-T had been administered to chicken eggs on day 8 of incubation. However, injection of 7 mg/kg 2,4,5-T on day 15 of incubation adversely affected the learning ability of the hatched chicks. If injected at 150 mg/kg on the second day after hatching, 2,4,5-T causes a significant increase in general activity, but no effect on learning ability. At the spraying intensity recommended in Australia for blackberries, a bird's egg in the area sprayed would collect a surface dose of about 20 mg/kg. Birds could therefore be affected by normal spraying. The 2,4,5-T used for these studies was contaminated with dioxin at 0.03 ppm, which is lower than the levels found in the commercial product used in Australia.

81-3533. Diaz-Colon, J. D.; Bovey, R. W. (SEA, USDA, College Station, TX) Selected bibliography of the phenoxy acid herbicides. IX. Toxicological and physiological effects of 2,4-D. *Tex. Agric. Exp. Stn. Misc. Publ.* 1454: 1-92; 1980 (810 references).

A list of 810 references dealing with toxic and other health aspects associated with 2,4-D is presented. The references are listed in alphabetical order by author's name. References deal with acute, subacute, and chronic toxicities, reproductive effects, and cytogenetic and car-

cinogenic effects. One-celled animals, nematodes, bryozoans, mollusks, earthworms, arachnids, crustaceans, insects, fishes, amphibians, reptiles, birds, and mammals are considered. Toxic, reproductive, cytogenetic, and carcinogenic effects of 2,4-D in humans are described. The fate of 2,4-D in humans, public health aspects, effects of 2,4-D in plants, and the effects in microorganisms are also referenced.

81-3534. Calhoun, M. C.; Ueckert, D. N.; Merrill, L. B.; Camp, B. J.; Baldwin, B. C., Jr. (Texas Agric. Exp. Stn., Sonora, TX) **Effect 2,4-D on hymenoxon levels and toxicity of bitterweed *(sic). Tex. Agric. Exp. Stn. Progr. Rep.* 3639: 16-22; 1980 (6 references).**

Levels of the toxic constituent hymenoxon in bitterweed (*Hymenoxys odorata*) sprayed at 1.54 lb acid equiv/acre (1.72 kg/ha) and 2,4-D were reduced from 0.93% to 0.76% (air-dry basis) 28 days after pesticide treatment. Herbicide-treated bitterweed was toxic to force-fed penned wether lambs and to grazing ewes. Grazing ewes kept on sprayed bitterweed plots for 14 or 21 days consumed an estimated 1.36 or 1.97%, respectively, of live wt/day. Of the 12 ewes kept on treated plots for 21 days, 5 died, although they had been removed from the plots after exhibiting toxic symptoms. Estimates of bitterweed intake were much higher than the reported minimum acute lethal dose of 1.3% of live wt, suggesting that estimates of bitterweed intake were in error or that ewes continuously exposed to bitterweed are more tolerant than pen-fed wether lambs.

81-3535. Torinuki, W.; Kumai, N.; Miura, T. (Dep. Dermatol., Sch. Med., Tohoku Univ., Sendai 980, Japan) **Histopathological studies on sun-exposed hexachlorobenzene-induced porphyric rat skin.** *Tohoku J. Exp. Med.* 134(4): 425-430; 1981 (11 references).

The relationship of sun exposure and development of porphyric skin in hexachlorobenzene (HCB)-treated rats is discussed. Twenty rats were fed 0.25% (w/w) HCB-diet for 2 mo to induce porphyria. Control rats received no HCB. Sunlight exposure tests were then conducted by treating groups of rats as follows: 10 normal rats and 6 porphyric rats were kept in darkness; 9 normal rats and 8 porphyric rats were exposed to the sun. Although the control groups showed no skin changes, sun exposure of porphyric rats caused erythema, erosion, crusts, skin thickening, and scarring. It is concluded that photosensitive flares were elicited within 2 mo. However, destruction of endothelial cells was not great.

81-3536. Johnson, T. L.; Knowles, C. O. (Dep. Entomol. Univ. Missouri, Columbia, MO 65211) **Inhibition of rat platelet 5-hydroxytryptamine uptake by chlordimeform.** *Toxicol. Lett.* 9(1): 1-4; 1981 (7 references).

Blood from Sprague-Dawley rats was used in studies to determine the effect of the insecticide chlordimeform and 2 of its metabolites on blood platelet 5-hydroxytryptamine (5-HT) uptake. Platelet-associated 5-HT-^{14}C was determined by radioassay. Chlordimeform and both metabolites inhibited rat blood platelet 5-HT uptake. Dimethylchlordimeform was the most potent inhibitor, with a pI50 of 4.2. It is not known whether the formamidine molecule binds to the platelet 5-HT uptake receptor.

81-3537. Giri, S. N.; Lunsman, P. (Dep. Physiol. Sci., Sch. Vet. Med., Univ. California, Davis, CA 95616) **Binding of (methyl-^{3}H)paraquat to rat, rabbit, hamster, mouse and guinea pig lung proteins, *in vitro*. *Toxicol. Lett.* 9(2): 93-100; 1981 (14 references).**

In vitro studies were performed on the binding of (methyl-^{3}H)paraquat to lung proteins of the rat, hamster, guinea pig, mouse, and rabbit. Lung slices were incubated with the labeled paraquat for 15, 30, 60, or 120 min, then homogenized and centrifuged. The protein pellet was analyzed by scintillation counting. The (methyl-^{3}H)paraquat was found to bind covalently to acid-insoluble proteins, probably due to formation of paraquat free radicals. Binding was inhibited by preincubation with CN, 2,4-dinitrophenol, *p*-hydroxymercuribenzoate, and cysteine. Anaerobic conditions stimulated binding. Lung proteins from the various test animals showed no differences in covalent binding of (methyl-^{3}H)paraquat.

81-3538. Peterson, A.; Lewne, M.; Walum, E. (Unit Neurochem. & Neurotoxicity, Univ. Stockholm, S-172 46 Sundbyberg, Sweden) **Acute toxicity of organic solvents, heavy metals and DDT tested in cultures of mouse neuroblastoma cells.** *Toxicol. Lett.* 9(2): 101-106; 1981 (18 references).

An *in vitro* method using neuroblastoma C1300 cells for evaluating acute toxicity is described and applied to organic solvents, heavy metals and DDT. After incubation of the cells with test substances at 10^{-7} to 10^{-4} *M*, a phase contrast microscope was used to determine the percent of detected cells. The TD25 values, the concentrations of test substance that would cause 25% of the cells to detach, were calculated and values were compared with LD50 values. The TD25 value for *p,p'*-DDT was was 14 μg/ml. A correlation was found between TD25 and LD50 values. When the logarithm of the LD50 values were plotted *vs.* the logarithm of the TD25 values, a straight line was obtained, with a correlation coefficient of 0.98.

81-3539. Cisson, C. M.; Wilson, B. W. (Dep. Avian Sci., Univ. California, Davis, CA 95616) **Paraoxon in-**

creases the rate of synthesis of acetylcholinesterase in cultured muscle. *Toxicol. Lett.* 9(2): 131-135; 1981 (15 references).

Acetylcholinesterase (AChE) was determined in both cells and media following treatment of cultured chick embryonic pectoral muscle with paraoxon, the anticholinesterase metabolite of parathion. Paraoxon treatment levels were 1×10^{-7} *M* or 3×10^{-7} *M*. AChE activity significantly increased following brief paraoxon exposure. Paraoxon also increased the rate of AChE degradation, suggesting that the higher AChE activity was due to a stimulation of enzyme synthesis.

81-3540. Caroldi, S.; Lotti, M. (Ist. Med. Lavoro, Univ. Padova, I-35100 Padova, Italy) **Delayed neurotoxicity caused by a single massive dose of dichlorvos to adult hens.** *Toxicol. Lett.* 9(2): 157-159; 1981 (6 references).

A moderate neuropathic response was demonstrated in hens given a single massive sc dose of dichlorvos (100 mg/kg AI in a commercial 50% formulation). Neurotoxic esterase (NTE; the target in delayed neurotoxicity) assay was carried out 24 hr after dosing in brain, spinal cord, and peripheral nerve. Mild signs of ataxia were seen 12-14 days after dosing. After 24 hr, NTE was inhibited 79-90% in peripheral nerve, 70-81% in spinal cord, and 89-92% in brain. It is suggested that in man repeated dichlorvos exposure would cause neuropathy only at doses causing severe cholinergic effects at every exposure.

81-3541. Kavlock, R. J.; Chernoff, N.; Hanisch, R. C.; Gray, J.; Rogers, E.; Gray, L. E., Jr. (US EPA, Health Effects Res. Lab., Research Triangle Park, NC 27711) **Perinatal toxicity of endrin in rodents. II. Fetotoxic effects of prenatal exposure in rats and mice.** *Toxicology* 21(2): 141-150; 1981 (11 references).

Pregnant CD rats and CD-1 mice were given endrin by gastric intubation. Mice received endrin levels of 2.0, 1.5, 1.0, 0.5 or 0 mg/kg/day. Rats received doses of 0.450, 0.330, 0.150, 0.075, or 0 mg/kg/day. Mice and rats were killed on days 18 and 21 of gestation, respectively. In the mice, dose-related indications of maternal toxicity were noted, including death, decreased wt gain during pregnancy, and increased liver/body wt ratios. No effect on embryonic survival was seen, but fetal wt was reduced in a dose-related fashion. Dosage groups above 0.5 mg/kg/day were individually affected. Dose-related changes were noted in the number of caudal vertebrae, in the ossification of the supraoccipital, and in the development of the renal pelvis. No dose-related changes of skeleton or soft tissue were seen. Pregnant rats demonstrated marked reductions in maternal wt gain. No evidence was found that endrin affected fetal development. Hepatic tissue residue levels rose to 327 ppb for dams receiving 0.450 mg/kg. Fetal tissue burdens rose to 27 ppb at the 0.450 mg/kg dose level. It was concluded that endrin was not teratogenic in the rat or mouse when administered at maternally toxic dose levels throughout the period of organogenesis.

81-3542. Gray, L. E., Jr.; Kavlock, R. J.; Chernoff, N.; Gray, J. A.; McLamb, J. (Exp. Biol. Div., Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **Perinatal toxicity of endrin in rodents. III. Alterations of behavioral ontogeny.** *Toxicology* 21(3): 187-202; 1981 (15 references).

Effects of prenatal endrin exposure on the behavioral development of rats and hamsters were studied. Behavioral parameters observed were development of reactive locomotor activity, running wheel activity in hamsters, and sexual development in the male hamster. Hamsters were administered endrin at a level of 0.75 or 1.5 mg/kg/-day on day 5-14 of gestation. Rats were treated with endrin at 0.3 0.15, or 0.75 mg/kg/day on days 7-15 of gestation. In hamsters, 1.5 mg/kg/day produced a persistent elevation in the locomotor activity in the offspring, but no effect on non-locomotor behavior (sexual, rearing, running wheel). In the rat, doses of 0.15 or 0.30 mg/kg/day resulted in offspring 30% more active than controls prior to weaning, but not as adults. Endrin produces acute behavioral effects at low dose levels, which may be of special concern in view of its persistence in the environment and its capability for biological magnification in the food chain.

81-3543. Hansen, L. G.; Strik, J. J. T. W. A.; Koeman, J. H.; Kan, C. A. (Coll. Vet. Med., Univ. Illinois, Urbana, IL 61801) **Biological activity of technical Aroclor 1254 compared to Aroclor 1254 residues: swine fat residues fed to broiler cockerels.** *Toxicology* 21(3): 203-212; 1981 (32 references).

The biological activity of Aroclor 1254 in broiler chicks was compared under 2 different circumstances: chicks fed the PCB at dietary concentrations of 0.07-9.0 mg/kg, and chicks fed PCB residues via fat from PCB-treated swine. At the end of the experimental period, histological examinations of tissues were carried out, and livers were analyzed for enzymes, residues, and fat levels. Neither treatment produced changes in growth, relative organ wt, microsomal protein, or high affinity *p*-nitroanisole (*p*NA) *O*-dealkylase. Chicks fed the swine-residue PCB showed a higher proportion of strong microsomal inducers, while those fed the dietary PCB showed higher induction levels of ethoxyresorufin *O*-dealkylase and *p*NA *O*-dealkylase. Ethoxyresorufin *O*-dealkylase was induced at dietary PCB levels below 1 mg/kg; however, PCB levels of 9 mg/kg were required to significantly increase cytochrome P-450. These results are discussed with regard to the major components of the dietary PCB and the swine-residue PCB.

81-3544. Chu, L.; Villeneuve, D. C.; MacDonald, B. L.; Secours, V. E.; Valli, V. E. (Environ. & Occup. Toxicol. Div., Bur. Chem. Hazards, Dep. Natl. Health & Welfare, Tunney's Pasture, Ottawa, Ontario K1A OL2, Canada) **Reversibility of the toxicological changes induced by photomirex and mirex.** *Toxicology* 21(3): 235-250; 1981 (13 references).

Reversibility of the chemical and histological alterations induced by photomirex and mirex in rats was studied. Male rats were fed diets containing photomirex (0.05, 0.5, 5.0, or 50 ppm) or mirex (5 or 50 ppm) for 28 days. At 28 days, 10 animals/group were sacrificed, and the remaining animals placed on clean feed for another 12, 24, and 48 wk. Animals were observed for signs of toxicity, hematological studies were carried out, and after-sacrifice residues were determined in various tissues. The data indicate photomirex and mirex to be extremely persistent compounds, resulting in biochemical and histological changes long after exposure has terminated. The lower body wt gain and reduced food consumption induced by 50 ppm photomirex and 50 ppm mirex were evident even after 12 wk on clean diet. Liver hypertrophy caused by 50 ppm photomirex persisted for 24 wk on clean diet, and histological changes in liver and thyroid were present for up to 48 wk on clean diet. In the 50-ppm photomirex group, significant photomirex levels were still evident in all tissues examined to 48 wk postexposure.

81-3545. Stillwell, W. G. (Inst. Lipid Res., Baylor Coll. Med., Houston, TX 77030) **Methylthiolation: a new pathway of drug metabolism.** *Trends Pharmacol. Sci.* 2(9): 250-252; 1981 (20 references).

Methylthiolation results in the incorporation of a methylthio group into a molecule. This process has been studied in numerous compounds, including herbicides, aromatic hydrocarbons, and environmental contaminants. In the majority of examples reported in the literature, the introduction of the methylthio group is associated with glutathione conjugation and mercapturic acid excretion. In some compounds the introduction of a sulfur atom is likely to be the result of a nucleophilic attack on the electron-deficient carbon atom, and metabolic activation of the substrate may not be necessary for reaction with the sulfur to occur. In other cases initial metabolism to a reactive intermediate is followed by nucleophilic attack by the sulfur atom. The study of the thioether metabolites of aromatic compounds is complicated by the fact that metabolites of the dihydrohydroxy series readily revert to the aromatic compounds by dehydration. Oxidation of methylthio-containing metabolites has been reported. Methylsulfinyl and methylsulfonyl derivatives are also found. Propachlor is metabolized to a methylsulfone. Methylthio derivatives have been found predominantly in those cases where the glutathione pathway was important in the metabolism of foreign compounds, suggesting these metabolites are derived from the corresponding glutathione or cysteine derivatives.

81-3546. Pesotskaya, G. V.; Petrenko, V. S.; Panasyuk, A. I.; Danchenko, M. N.; Kasukhin, L. F.; Gololobov, Yu. G. (Inst. Org. Chem., Acad. Sci. Ukrainian SSR, Kiev, USSR) **Antikholinesteraziaya aktivnost' i toksichnost' zameshchennykh O,O-dialkil-s-vinilfosfatov i solei tiovinilfosfoniya. [Anticholinesterase activity and toxicity of substituted O,O-dialkyl-s-vinyl phosphates and thiovinyl phosphonium salts.]** *Ukr. Biokhim. Zh.* 53(4): 35-41; 1981 (14 references) (Russian).

To evaluate the mechanism of toxicity of organophosphorus pesticides, a kinetic study of reversible inhibition of human erythrocyte and housefly head acetyl cholinesterase with thiovinyl phosphates was performed, and the activation effect of thioalkyl-substituents in the vinyl group was conducted. Thiovinyl phosphates *in vitro* were less selective to the insect enzyme than the corresponding oxygen analogs. Their inhibitory potency rose with lengthening of the alkoxyl radicals at a phosphorus atom, but no correlation with toxicity was observed. Phosphonium salts having a thiovinyl substituent inhibited the enzyme via a reversible mechanism.

81-3547. Burrows, W. D.; Cogley, D. R.; Light, W. G.; Dacre, J. C.; Woodard, G. (Med. Bioeng. Res. & Devel. Lab., US Army, Fort Detrick, Frederick, MD 21701) **Problem definition studies on potential environmental pollutants. VII. Physical, chemical, toxicological, and biological properties of DDT and its derivatives.** *US NTIS AD Rep.* AD-A094,236/7: 71 pp.; 1979 (187 references).

This report is a data base of physical chemical, toxicological and biological properties of DDT. Sufficient data are presented to allow a preliminary assessment of the human health impacts and ecological impacts of DDT at sites within the United States where DDT is found. This report is intended to be used with chemical analysis data of DDT concentrations in water, sediments, soils, and biota at particular sites of interest to develop a qualitative assessment of potential hazard. (Author abstract by permission)

81-3548. Carlson, G. P. (Purdue Univ., West Lafayette, IN) **Effects of halogenated aromatic compounds on the metabolism of foreign organic compounds.** *US NTIS PB Rep.* PB81-152,522: 85 pp.; 1981 (28 references).

This work was initiated to extend the previous findings on the induction of xenobiotic metabolism by the halogenated benzenes. Particular interest was focused on studying further the relationship between their long-term induction and their storage in body fat. A second objective was to determine if the brominated benzenes caused hepatic porphyria similar to that observed with the fungicide hexachlorobenzene. A third aim was to extend the observations to other halogenated benzenes in the enhancement of esteratic pathways of xenobiotic metabolism. In contrast to hexachlorobenzene, the brominated benzenes, including the fully substituted hexa-

bromobenzene, did not induce hepatic porphyria to any significant degree and did not cause increases in the secretion of porphyrins. Studies on the distribution and elimination of 1,2,4-trichlorobenzene and 1,2,4-tribromobenzene indicated that their prolonged inductive effects are related to their storage and slow release from body stores, particularly adipose tissue. The administration of Aroclor 1254 (PCB) resulted in prolonged increases in xenobiotic metabolism which could also be enhanced by starvation. (Author abstract by permission)

81-3549. Allan, D. J.; Daniels, R. E. (Water Resour. Res. Cent., Maryland Univ., College Park, MD) **Sublethal effects of pollutants: life table evaluation of chronic exposure of *Eurytemora affinis* (Copepoda) to Kepone.** *US NTIS PB Rep.* PB81-185,209: 24 pp.; 1980 (27 references).

Life table estimates of intrinsic rate of natural increase (r) were used to assess chronic toxicity of Kepone (chlordecone) to the copepod *Eurytemora affinis*. The acute toxicity (48-hr LD50) was determined to be 40 μg/l (95% CL 33.9-47.2). A reduction in (r) was observed at all concentrations above 5 μg/l and (r) was near zero at 20 μg/l. This was due to the combination of lowered survivorship, delayed onset of reproduction and reduced fecundity. The authors discussed the value of the life table approach both as an experimental protocol and an ecologically realistic bioassay of chronic effects, and document that as little as 21 days is an adequate test duration. (Author abstract by permission)

81-3550. Unger, T. M.; Kliethermes, J.; VanGoethem, D.; Short, R. D. (Midwest Res. Inst., Kansas City, MO) **Teratology and postnatal studies in rats of the propylene glycol butyl ether and isooctyl esters of 2,4-dichlorophenoxyacetic acid.** *US NTIS PB Rep.* PB81-191,140: 27 pp.; 1981 (7 references).

The purpose of this study was to evaluate the teratogenic potential of the propylene glycol butyl ether (PGBE) and isooctyl (IO) esters of 2,4-dichlorophenoxyacetic acid (2,4-D). Accordingly, groups of pregnant CD rats received daily oral doses of PGBE or IO equivalent to 0, 6.25, 12.5, 25.0, or 87.5 mg/kg/day of 2,4-D from day 6 through day 15 of gestation, and fetuses were observed for gross, soft tissue, and skeletal defects. In addition, a postnatal study was performed on rats receiving 0, 12.5, or 87.5 ME/kg/day PGBE or IO to determine the effect of treatment on growth and survival of pups. No adverse effects were observed on maternal welfare, nor was there any evidence of embryo or fetal lethality in any of the treated groups. Of the anomalies observed, the incidence of lumbar (14th) rib buds was found to be statistically increased in the groups given the 87.5 mg/kg/day doses of both PGBE and IO. No other anomaly reached a level of statistical or toxicological significance. The number of pups/litter was significantly reduced on postpartum days 4 and 7 in dams receiving 87.5 ME/kg/day IO. However, mean pup body wt remained normal. Postnatal growth and survival of pups receiving PGBE were not adversely affected. It was concluded that PGBE and IO caused minor embryotoxicity that was not deleterious to growth and survival, and therefore was not teratogenic to offspring of treated rats. (Author abstract by permission)

81-3551. Coppock, R. W.; Buck, W. B.; Mabee, R. L. (Anim. Poison Control Cent., Dep. Vet. Biosci., Coll. Vet. Med., Univ. Illinois, Urbana, IL 61801) **Toxicology of carbon disulfide: a review.** *Vet. Hum. Toxicol.* 23(5): 331-336; 1981 (55 references).

A review of the toxicology of carbon disulfide (CS_2) is presented. The compound, a fumigant for grains, is absorbed by dermal, oral, inhalation, and parenteral routes. It is deposited in the body in the free and bound forms. Free CS_2 is highly reactive with nucleophilic cellular components such as amino acids, catecholamines and steroids. Testosterone and glucocortical steroid production are inhibited by CS_2, as is protein synthesis. Other effects that have been observed are myocardial lesions, rupture of blood vessels, gastrointestinal distress, disruption of peripheral and central nervous system functions, vomiting, ataxia and abnormal reflexes. CS_2 has also been implicated in abortions, chronic metritis, sterility, amenorrhea and abnormal menstrual cycles in women. Some acute lethal doses are provided. Values range from 1 g (human, ingested) to 3212 ppm (human, inhaled). Other LD50 values presented are 300 mg/kg for rabbits and 400 mg/kg for guinea pigs.

81-3552. Robens, J. F. (Author address not given) **Carcinogenicity testing and toxaphene.** *Vet. Hum. Toxicol.* 23(5): 348; 1981.

Testing for the carcinogenicity of toxaphene is discussed. Important factors to be considered when assessing the carcinogenicity of any compound include choice of the chemical form used, species or strain tested, housing and care of animals, pre-chronic testing, administration of the test agent, prompt necropsy following death, adequate fixation and histological evaluation of tissues, meaningful statistical analyses, and extrapolation of results to humans. The author contends that although the follicular cell adenomas and thyroid carcinomas observed in National Cancer Institute studies were not clearly related to the treatment, hepatocellular carcinomas were apparently related to toxaphene exposure. (Presented at the Symposium on Safety Evaluation of Drugs and Chemicals)

81-3553. Tenenbein, M. (Fac. Med., Univ. Manitoba, Winnipeg, Manitoba, Canada) **Toxic encephalopathy due to insect repellant ingestion.** *Vet. Hum. Toxicol.* 23(5): 363; 1981.

Three cases of encephalopathy following ingestion of the insect repellent diethyl-*m*-toluamide (Deet) are reported. Although hospitalization was required, recovery was complete in all cases. Symptoms were similar to previously reported symptoms from human exposures and animal studies. (Presented at the Symposium on Safety Evaluation of Drugs and Chemicals)

81-3554. Murray, H. E.; Guthrie, R. K. (Dep. Chem., Texas A & M Univ., College Station, TX 77843) **Metabolic responses of aquatic bacterial populations to selected insecticides.** *Water Resour. Bull.* 16(4): 749-751; 1980 (9 references).

Sevin (carbaryl) and malathion were tested for their effects on bacterial populations indigenous to a fresh water reservoir. The reservoir water samples were placed in aquaria to which 5 mg/l Sevin or malathion were added at 23°, 28°, or 33°C. Bacteria counts were made daily, and metabolism was studied using Warburg manometry. Addition of Sevin increased O_2 uptake, indicating degradation of Sevin. Malathion showed no significant effect on metabolic rates at any test temperature; however, it appeared that inhibition was beginning to occur at 33°C. No measurable effects of the 2 insecticides were seen on the predominance of genera. The observed effects were concluded to be due to the mixed culture response, rather than to the selection of certain genera.

81-3555. Renner, G. (Inst. Pharmakol. & Toxikol., Univ. Munechen, D-8000 Munich 2, BRD) **Biotransformation of the fungicides hexachlorobenzene and pentachloronitrobenzene.** *Xenobiotica* 11(7): 435-446; 1981 (45 references).

This overview of the metabolism of the fungicides hexachlorobenzene (HCB) and pentachloronitrobenzene (PCNB; quintozene) indicates similarities in their pathways of biotransformation. Several metabolites of HCB and PCNB, such as chlorinated benzenes, the mercapturic acid, thiophenols, thioanisoles, and phenols are identical. Both fungicides initially react with glutathione, with elimination of chlorine or of the nitro group respectively. The conjugate, *S*-(pentachlorophenyl) glutathione, is further metabolized by cleavage of the glutamate and glycine residues and acetylation of the amino group of the cysteinyl moiety, to give the mercapturic acid, *N*-acetyl-S-(pentachlorophenyl) cysteine, a major metabolite of HCB and PCNB in rats and rabbits respectively, which is further metabolized to simpler sulfur-containing products. (Author abstract by permission)

81-3556. Larsen, G. L.; Bakke, J. E. (Metab. & Radiat. Res. Lab., Agric. Res., SEA, USDA, Fargo, ND 58105) **Enterohepatic circulation in formation of propachlor (2-chloro-*N*-isopropylacetanilide) metabolites in the rat.** *Xenobiotica* 11(7): 473-480; 1981 (10 references).

Bile secreted from rats given single oral doses of 2-chloro-*N*-isopropylacetanilide (propachlor) contained 58% dose as metabolites from the mercapturic acid pathway (glutathione, mercapturate, cysteine conjugates, and a sulfoxide of the mercapturate). Bile secreted from rats given single oral doses of the cysteine conjugate of propachlor contained glucuronide conjugates of hydroxylated 2-methylsulfonyl- *N*-isopropylacetanilides. In contrast, when the intestinal microflora were bypassed by iv administration of the cysteine conjugate of propachlor, the bile contained only the mercapturate and the sulfoxide of the mercapturate. Rats fed an antibiotic-containing diet and given single oral doses of either propachlor or the cysteine conjugate of propachlor excreted only mercapturic acid pathway metabolites in the urine, bile, and feces, and no methylsulfonyl-containing metabolites. Fecal ^{14}C from the antibiotic-fed rats given either propachlor or the cysteine conjugate of propachlor was extractable, in contrast to previously reported unextractable fecal ^{14}C residues from untreated rats given propachlor orally. From these results, we conclude that metabolism by the microflora was necessary for production of the methylsulfonyl-containing metabolites excreted by the rat. Enterohepatic circulation of the xenobiotic moiety of these mercapturic acid pathway metabolites is influenced by the presence of a microbial C-S lyase. (Author abstract by permission)

81-3557. Sadovnikova, L. D.; Anders, V. N.; Sal'nikov, V. V. (Repub. Cent. Treat. Acute Poisoning, N. V. Sklifosovskii Inst. First Aid, Acad. Med. Sci., Moscow, USSR) **Osobennosti raspredeleniya atsetilkhinesterazy v mozge cheloveka i shivotnikh pri deistvii na organizm antikholinesteraznykh veshchestv. [Characteristics of acetylcholinesterase distribution in the human and animal brain under the effect of anticholinesterase substances in the body: cytochemical study.]** *Zh. Nevropatol. Psikhiatr. im. S. S. Korsakova* 81(2): 108-114; 1981 (10 references) (Russian).

The localization of acetylcholinesterase (AChE) in human and rat brain during acute poisoning with organophosphorus compounds (OPC) was studied using contemporary methods of light and electron cytochemistry. Cytochemical methods were used to study AChE distribution in various sections of the brain in 6 persons who died from acute poisoning with thiophos (parathion), carbophos (malathion) and chlorophos (trichlorfon) and in the brain of rats that died after administration of a lethal dose of OPC under experimental conditions. Results showing that inactivation of the enzyme occurs primarily in the capillaries, nerve processes and synapses suggest that the trend toward destruction of AChE in nerve tissue is con-

nected with the characteristics of penetration of the toxic factor through a barrier of the brain external to the neuron. Cytochemical methods for study of AChE in brain during acute OPC poisoning make it possible to specify the characteristics of the process of enzyme inactivation in nerve tissue and to obtain new data which will lead to understanding of the mechanism of reparative processes in the brain connected with restoration of its function.

See also 81-3302, 81-3303, 81-3304, 81-3306, 81-3307, 81-3308, 81-3317, 81-3318, 81-3319, 81-3320, 81-3321, 81-3322, 81-3324, 81-3325, 81-3327, 81-3328, 81-3329, 81-3330, 81-3331, 81-3332, 81-3335, 81-3336, 81-3337, 81-3338, 81-3339, 81-3340, 81-3345, 81-3346, 81-3347, 81-3349, 81-3350, 81-3351, 81-3352, 81-3353, 81-3354, 81-3356, 81-3357, 81-3359, 81-3362, 81-3367, 81-3368, 81-3369, 81-3370, 81-3371, 81-3372, 81-3373, 81-3374, 81-3375, 81-3376, 81-3377, 81-3381, 81-3383, 81-3397, 81-3405, 81-3407, 81-3442, 81-3445, 81-3446, 81-3450, 81-3451, 81-3452 *and* 81-3596.

81-3558. Wells, D. E.; Cowan, A. A. (Freshwater Fish. Lab., Faskally, Pitlochry, Perthshire PH16 5LB, England) **Determination of the mothproofing agent Eulan WA (New) in fish tissue using gas - liquid chromatography following extractive methylation.** *Analyst (London)* 106(1265): 862-868; 1981 (7 references).

A method for the determination of Eulan WA (New) [AI polychloro-2-(chloromethylsulfonamido) diphenyl ether (PCSD)] is described. The PCSDs are extractively methylated using tetrabutylammonium (TBA) ion, which forms ion pairs with sulfonamide at pH 10-12. This ion pair is subsequently back-extracted into the organic phase and methylated using methyl iodide. The methyl derivative of the PCSDs were quantified by gas-liquid chromatography using electron-capture detection. The coefficient of variation ($p > 0.05$) for perch liver was 4.82 mg/kg ± 5.6% for between-batch extractions. The minimum detectable concentration for a 5-g sample was 0.005 mg/kg of fresh tissue. (Author abstract by permission)

81-3559. Shafer, K. H.; Cooke, M.; DeRoos, F.; Jakobsen, R. J.; Rosario, O.; Mulik, J. D. (Columbus Lab., Battelle, Columbus, OH 43201) **WCOT capillary column GC/FT-IR and GC/MS for identifying toxic organic pollutants.** *Appl. Spectrosc.* 35(5): 469-472; 1981 (7 references).

A standard solution of priority pollutants was analyzed by the combined data obtained from high-resolution gas chromatography/Fourier transform IR spectroscopy (GC/FT-IR) and gas chromatography mass spectrometry (GC/MS). The pollutants included toxaphene, lindane, and heptachlor. These semivolatile pollutants were injected without splitting into the GC/FT-IR (1.5 μl/μl/component) and GC/MS (diluted to 15 ng/μl/component). It was concluded that wall-coated open tubular (WCOT) columns can be used for both GC/FT-IR and GC/MS, yielding the same chromatographic separation for each technique. It was noted that achieving the same chromatography means that data from the 2 techniques is directly comparable, which will facilitate a more rapid, more effective use of the combined spectral data. WCOT chromatography gives the high resolution needed for analysis of complex environmental samples. The GC/FT-IR was less sensitive than GC/MS, but GC/FT-IR sensitivity was improved using WCOT columns. The use of the combined data increased the number of correct assignments obtained in complex environmental analyses.

81-3560. Ogierman, L.; Silowiecki, A. (Inst. Plant Prot., PL-44153 Sosnicowice, Poland) **Thin-layer and gas chromatographic separation of the stereoisomers of some synthetic pyrethroids.** *Chromatographia* 14(8): 459-461; 1981 (14 references).

The separation of the stereoisomeric synthetic pyrethroids allethrin, resmethrin, and permethrin by thin layer chromatography (TLC) and gas chromatography is considered. Because insecticidal activity of synthetic pyrethroids is influenced by their stereoisomeric structure, the use of conditions that permit the separation of the *cis-trans* isomers is important. Neither OV-17 nor SE-30 type silicone stationary phase (usually used for the analysis of oil-based pyrethroid formulations) efficiently separates these isomers. Separation of the pyrethroids was performed using precoated TLC glass plates covered with silica gel 60 F-254; 2-μl aliquots of the 5 mg/ml acetonic solutions of the pyrethroid stereoisomers were developed. Rf factors for *cis* and *trans* isomers of allethrin were 0.40 and 0.48, for resmethrin 0.63 and 0.71, and for permethrin 0.68 and 0.75. Qualitative separation obtained with TLC was confirmed by gas chromatography.

81-3561. Siminski, K. R.; Manning, T. J.; Lukash, L. (Nassau County Med. Exam. Off., East Meadow, NY 11554) **Separation of organophosphate, chlorinated, and carbamate insecticides using conventional and reverse-phase thin-layer chromatography.** *Clin. Toxicol.* 18(6): 731-735; 1981 (12 references).

This paper demonstrates that the RPTLC system can be used as a confirmation tool for regular adsorption TLC because it separates the pesticides of interest and also reverses their positions on the plate due to their partitioning with water solubility. A clinical procedure was devised for screening samples of gastric contents and urine for chlorinated, organophosphate, and carbamate insecticides via the use of conventional TLC. The presence of these insecticides was then confirmed by reverse-phase TLC via spotted TLC plates. In view of the plethora of insecticides currently found in the home, and in view of the numerous incidents of adults and children accidentally or purposely ingesting them, this confirming procedure should prove to be a clinical valuable tool in crucial emergency situations. (Author abstract by permission, modified)

81-3562. McIntyre, A. E.; Perry, R.; Lester, J. N. (Public Health Eng. Lab., Dep. Civ. Eng., Imp. Coll., London SW7 2AZ, England) **Development of a method for the analysis of polychlorinated biphenyls and organochlorine insecticides in sewage sludges.** *Environ. Technol. Lett.* 1(3): 157-168; 1980 (25 references).

A method is presented for the analysis of polychlorinated biphenyls and organochlorine insecticides in sewage sludges. After concentration of the solvent extract, clean-up was carried out using an alumina/alumina + silver nitrate column and hexane eluent. After concentration of the eluent, separation of PCB and organochlorine insecticides was achieved using a modification of a silica gel column-chromatographic procedure. Aliquots of each of the 2 eluent fractions obtained were then analyzed by electron capture gas liquid chromatography. Concentrations of organochlorine insecticides in the extracts were

calculated by measuring peak heights on the chromatograms and referring these data to previously constructed calibration curves. This procedure produced quantitative results with known levels of the contaminants; recoveries were 99.8, 99.6, 102.5, and 102.3% for Arochlor 1260, *p,p'*-DDE, γ-HCH (γ-BCH; lindane), and dieldrin, respectively. This procedure may be of use where sludge samples of various composition and total solids concentrations are to be analyzed.

81-3563. Reuland, D. J.; Trinler, W. A. (Dep. Chem., Indiana State Univ., Terre Haute, IN 47809) **An investigation of the potential of high performance liquid chromatography for the comparison of soil samples.** *Forensic Sci. Int.* 18(2): 201-208; 1981 (11 references).

The use of high performance liquid chromatography (HPLC) for the analysis of soil samples for pollutants was investigated. Soil samples were collected from a variety of urban and suburban locations, dried, homogenized, and extracted with acetonitrile. The chromatographic profiles that contained peaks at one or more different retention times were termed to be qualitatively different. Those that contained peaks at the same retention times, but with much different intensity ratios, were termed qualitatively similar but quantitatively different. The components of the samples were not identified. The profiles of extractable organic constituents of soils, when used in conjunction with other variables, is a simple means of comparing soil samples. From a forensic viewpoint, it is suggested that this technique could demonstrate organic constituents of soil that result from acts of man, such as pesticides, which would vary from location to location.

81-3564. Pilenkova, I. I.; Yurkova, R. G. (Branch Off. Inst. Chem. Agents Plant Prot., Ufa, USSR) **Metod razdel'nogo opredeleniya atrazine, prometrina i simazina v vozdukhe pri proizvodstve kombinirovannykh preparatov Agelon i Sitrin. [Method of separate determination of atrazine, prometryne, and simazine in air during production of the combined preparations Agelon and Sitryn.]** *Gig. Tr. Prof. Zabol.* (7): 51-52; 1981 (3 references) (Russian).

Results of separate determinations of simazine, prometryne, and atrazine in the air during manufacture of the herbicide mixtures Agelon (atrazine + prometryne) and Sitryn (prometryne + simazine) are reported. Air samples were aspirated through the aerosol filter and the extracts were subjected to thin layer chromatography in aluminum oxide. Sensitivity of the method was 0.5 mg/m³.

81-3565. Angerer, J.; Heinrich, R.; Laudehr, H. (Ord. Arbeitsmed. Univ., D-2000 Hamburg 76, BRD) **Occupational exposure to hexachlorocyclohexane. V. Gas chromatographic determination of monohydroxychlorobenzenes (chlorophenols) in urine.** *Int. Arch. Occup. Environ. Health* 48(4): 319-324; 1981 (11 references).

A gas chromatographic method is described that is sensitive and specific for the simultaneous determination of 10 chlorinated phenols: 2,6-, 2,4-, 2,3-, and 3,4-dichlorophenol; 2,4,6-, 2,4,5-, and 3,4,5-trichlorophenol; 2,3,4,6- and 2,3,4,5-tetrachlorophenol; and pentachlorophenol (PCP). These phenols are found in the urine of persons exposed to hexachlorocyclohexane (BHC). The method is based on the hydrolysis of the phenolic compounds in urine and subsequent derivatization with acetic anhydride. To determine the accuracy and precision of the method, pooled urine from unexposed persons spiked with definite amounts of each chlorophenol was analyzed. Concentrations were between 58 and 220 μg/l. Recoveries ranged between 87 and 119%. The coefficients of variation were between 4.4 and 10.1%. The detection limit for each chlorophenol in urine ranged between 4.9 and 18.6 μg/l. There was no need for a clean-up procedure by column chromatography.

81-3566. Siegel, M. M.; Hildebrand, B. E.; Hall, D. R. (Res. & Devel. Cent., FMC Corp., Princeton, NJ 08540) **Determination of permethrin in environmental waters by gas chromatography- selected ion-monitoring- mass spectroscopy using ion counting detection.** *Int. J. Environ. Anal. Chem.* 8(2): 107-126; 1980 (16 references).

A GC-SIM-MS technique that uses an LKB 9000 GC-MS modified for ion counting detection with a data system is demonstrated to be suitable for detecting low level contamination with permethrin. The use of ion counting extends the detection limits over that of the analog GC-MS system by a factor of about 25 times. Operator time is reduced and data interpretation improved. Levels in raw environmental water samples > 0.05 ppb permethrin can be routinely quantitated. The procedure for concentration and clean-up consists of passing the wastewater sample through a column packed with XAD-2 macroreticular resin. The eluted water is cycled through another equivalent column packed with XAD-2 resin. Absorbed components were then eluted with ethyl ether. The water layer was separated from the ether layer and extracted with ether. All ether fractions were combined and concentrated in a modified Kuderna-Danish evaporative concentrator. The concentrated extract was passed through a column of untreated Florisil to remove polar interferences and concentrated in a second evaporative concentrator.

81-3567. King, J. R.; Benschoter, C. A.; Burditt, A. K., Jr. (Subtrop. Hortic. Res. Unit, Agric. Res., SEA, USDA, Miami, FL 33158) **Residues of methyl bromide in fumigated grapefruit determined by a rapid, headspace assay.** *J. Agric. Food Chem.* 29(5): 1003-1005; 1981 (11 references).

A rapid headspace assay for methyl bromide (MB) in grapefruit has been developed and used to determine the effect of fumigant dose and storage time on the residues of MB resulting from fumigation. Salient steps of the assay are the blending of a 50 g grapefruit sample with water and assay of the headspace by use of a gas chromatograph equipped with a gas sample injection valve and a nickel-63 electron capture detector. The sensitivity (twice the background for samples of unfumigated grapefruit) was ~ 0.002 mg/kg. The partitioning of MB into the headspace was determined by using samples of unfumigated grapefruit fortified with MB at various concentrations. (Author abstract reprinted by permission of the American Chemical Society)

81-3568. Strankowski, K. J.; Stanley, C. W. (Agric. Chem. Div., Stanley Res. Cent., Mobay Chem. Corp., Stilwell, KS 66085) **Determination of residues of Mesurol and its sulfoxide and sulfone in plant, animal, and soil samples.** *J. Agric. Food Chem.* 29(5): 1034-1037; 1981 (10 references).

A gas-liquid chromatographic method was developed for measuring residues of Mesurol (methiocarb) and its sulfoxide and sulfone metabolites in plant, animal, and soil samples. The method involved an initial extraction, a precipitation step to remove waxes and pigments, and a silica gel column cleanup. The sample was then oxidized and/or passed through an alumina-Florisil column. The carbamates were hydrolyzed to the phenols which were silylated for gas-liquid chromatographic detection using a flame photometric detector operated in the sulfur mode. Recovery of the Mesurol compounds from crop, animal, and soil matrices fortified at 0.02, 0.05, 0.1, or 1.0 ppm ranged from 62 to 115%. The lower limit of detection was 0.02 ppm for each compound, and control values were <0.02 ppm. (Author abstract reprinted by permission of the American Chemical Society)

81-3569. Stanley, C. W.; Delphia, L. M. (Agric. Chem. Div., Mobay Chem. Corp., Kansas City, MO 64120) **Matacil residue determination in foliage, fish, soil, and water.** *J. Agric. Food Chem.* 29(5): 1038-1039; 1981 (5 references).

A method for detecting Matacil (aminocarb) residue in foliage, fish, soil, and water has been developed. After the residue was extracted from the sample, the Matacil was partitioned between organic and aqueous solutions for cleanup. Matacil was then derivatized with 1-fluoro-2,4-dinitrobenzene and detected by gas chromatography with an electron capture detector. Recoveries from foliage, fish,and soil fortified at 0.05 ppm and from water fortified at 0.01 and 0.005 ppm ranged from 68 to 127%. The lower limit of detection was <0.01 ppm for foliage, fish, and soil and was <0.001 ppm for water. (Author abstract reprinted by permission of the American Chemical Society)

81-3570. Ross, B.; Harvey, J. (Honey Bee Pestic./Dis. Res., Western Region, Agric. Res., USDA, Univ. Stn., Laramie, WY 82071) **A rapid, inexpensive, quantitative procedure for the extraction and analyses of Penncap-M (methyl parathion) from honeybees (*Apis mellifera* L.), beeswax and pollen.** *J. Agric. Food Chem.* 29(5): 1095-1096; 1981 (10 references).

A rapid, inexpensive, quantitative procedure for the acetone-*O*-xylene (19:1) extraction of Penncap-M (methyl parathion) from honeybees (*Apis mellifera* L.), beeswax, and pollen is reported. Mean recoveries by gas liquid chromatography for 6 concentrations of methyl parathion were 98.0, 97.8, and 94.2% from honeybees, beeswax, and pollen, respectively. Mean recovery of methyl parathion from honey seeded at 5 concentrations of Penncap-M was 87.3%. (Author abstract reprinted by permission of the American Chemical Society, modified)

81-3571. Forrette, J. E. (Velsicol Chem. Corp., Chicago, IL, 60611) **Infrared spectrophotometric method for methazole formulations: collaborative study.** *J. Assoc. Off. Anal. Chem.* 64(5): 1185-1186; 1981.

An infrared method was developed for the analysis of Probe 75% wettable powder formulation for methazole content. The procedure involves an extraction of the powder by agitation with acetone. The suspension is centrifuged, and the clear supernatant liquid is measured for absorbance at 755 cm^{-1}. A collaborative study was conducted with 10 laboratories participating. One laboratory omitted the centrifugation, which resulted in a low assay. Statistical analysis of the data showed no significant variances. The coefficient of variation for 10 laboratories analyzing 2 samples in duplicate was 1.29%. The method has been adopted interim official first action. (Author abstract reprinted by permission)

81-3572. Luke, M. A.; Froberg, J. E.; Doose, G. M.; Masumoto, H. T. (FDA, Los Angeles, CA 90015) **Improved multiresidue gas chromatographic determination of organophosphorus, organonitrogen, and organohalogen pesticides in produce, using flame photometric and electrolytic conductivity detectors.** *J. Assoc. Off. Anal. Chem.* 64(5): 1187-1195; 1981 (14 references).

The multiresidue procedure of Luke et al., which uses extraction with acetone and partition with petroleum ether and methylene chloride, was simplified and shortened by eliminating the Florisil cleanup. Double concentration with petroleum ether in the Kuderna-Danish evaporator following the initial concentration removed the last traces of methylene chloride. The extract was then injected into a gas chromatograph, using a Hall electrolytic conductivity detector for organohalogen, organonitrogen, and organosulfur pesticides or a flame photometric detector for organophosphorus pesticides. Recoveries of 79 pesticides are presented. (Author abstract by permission)

81-3573. Reichel, W. L.; Kolbe, E.; Stafford, C. J. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Gas-liquid chromatographic and gas-liquid chromatographic-mass spectrometric determination of fenvalerate and permethrin residues in grasshoppers and duck tissue samples.** *J. Assoc. Off. Anal. Chem.* 64(5): 1196-1200; 1981 (7 references).

A procedure is described for determining fenvalerate and permethrin residues in grasshoppers and duck tissues. Samples are Soxhlet-extracted with hexane and cleaned up by gel permeation chromatography with an in-line alumina column. Samples are analyzed by gas-liquid chromatography with electron capture detection, and confirmed by gas-liquid chromatography-mass spectrometry. The average recovery from fortified tissues was 97%. (Author abstract by permission)

81-3574. Guinivan, R. A.; Thompson, N. P.; Bardalaye, P. C. (Pestic. Res. Lab., Univ. Florida, Gainesville, FL 32611) **Simultaneous electron capture detection of chlorpyrifos and its major metabolite, 3,5,6-trichloro-2-pyridinol, after gel permeation chromatography.** *J. Assoc. Off. Anal. Chem.* 64(5): 1201-1204; 1981 (17 references).

Preparative gel permeation chromatography of ethyl acetate extracts of Southern Pea vines precedes the simultaneous quantitation by electron capture gas chromatography of chlorpyrifos and its major metabolite 3,5,6-trichloro-2-pyridinol, which is analyzed as its *N,O*-bis(trimethylsilyl) acetamide derivative. The dark green extract of a pea vine sample (spiked with both the pesticide and its metabolite) is concentrated and chromatographed on a Bio-Beads S-X3 column. Factors are monitored for cleanup effectiveness by measuring the absorbance at 490 nm and also by gas chromatographic analysis for chlorpyrifos and 3,5,6-trichloro-2-pyridinol recovery. Results showed that the pesticide and its metabolite are separated from the bulk of optically absorbent compounds. Recoveries from 25 g spiked pea vine samples, cleaned up on the Bio-Beads column, are 100% at levels of 0.2 ppm (5 μg) and above, and 62% at levels ranging from 0.01 (0.25 μg) to 0.2 ppm. This analytical procedure provides a fast, sensitive method for simultaneous quantitation of these compounds which were previously determined by 2 separate procedures. (Author abstract by permission)

81-3575. West, S. D.; Day, E. W., Jr. (Agric. Anal. Chem., Lilly Res. Lab., Eli Lilly & Co., Greenfield, IN 46140) **Extraction of aquatic herbicide fluridone from water and determination by high pressure liquid chromatography.** *J. Assoc. Off. Anal. Chem.* 64(5): 1205-1207; 1981 (9 references).

Fluridone is extracted from water onto a Sep-Pak C_{18} cartridge, and then eluted with a small volume of methanol. Fluridone is concentrated and then is measured by reverse phase high pressure liquid chromatography with UV detection at 254 nm. The method is sensitive to approximately 0.001 ppm and has resulted in recoveries averaging 103.1 ± 19.4, 94.8 ± 5.9, and 93.5 ± 8.5% for control water fortified with 0.001, 0.010, and 0.100 ppm (μg/ml) fluridone, respectively. (Author abstract by permission)

81-3576. Wilkes, P. S. (FDA, Altanta, GA 30309) **Gas-liquid chromatographic-mass spectrometric confirmation of endosulfan and endosulfan sulfate in apples and carrots.** *J. Assoc. Off. Anal. Chem.* 64(5): 1208-1210; 1981 (5 references).

A gas-liquid chromatography-mass spectrometric (GLC-MS) procedure is described for the confirmation of endosulfan I, endosulfan II, and endosulfan sulfate in apples and carrots. After extraction, cleanup, and determination by electron capture gas-liquid chromatography using current AOAC methodology, residues are confirmed by GLC-MS. The chemical ionization (CI) mode is used with methane as a reagent gas. Each residue is confirmed by a scan of only 4 regions of its mass spectrum rather than the full mass range. The 4 mass regions for the 2 endosulfan isomers are 274-280, 340-346, 368-374, and 402-412 atomic mass units (amu). For endosulfan sulfate, the mass regions are 286-294, 322-330, 384-392, and 420-428 amu. Four ions and their chlorine isotopic distributions are detected for each compound by this scanning technique. This method was developed by using carrots and apples to which had been added 0.1 ppm (50% of the current legal tolerance on carrots) of each of the 3 pesticides. The gas chromatographic retention times and the mass spectra of the 4 mass regions specified for the 3 pesticides were compared to those of reference standards injected under identical GLC-MS conditions and were used as the basis for confirming identity of the 3 compounds. (Author abstract by permission)

81-3577. Greenberg, R. S. (Plant Prot. Dep., Minist. Agric., Jaffa, Israel) **Gas-liquid chromatographic method for determining oxamyl in peppers, tomatoes, and cucumbers.** *J. Assoc. Off. Anal. Chem.* 64(5): 1216-1220; 1981 (8 references).

A simple and fast gas-liquid chromatographic method has been developed to determine residues of oxamyl insecticide in peppers, tomatoes, and cucumbers. Following sample extraction with ethyl acetate and cleanup on an alumina column, the compound is determined using a thermionic nitrogen-phosphorus detector. The limit of detection is 0.02 ppm based on a 40 g sample. Average recoveries for oxamyl at 0.025-1.0 ppm for all 3 products were 88-97%. (Author abstract by permission)

81-3578. Simonaitis, R. A.; Cail, R. S.; Zehner, J. M. (Stored Prod. Insects Res. & Dev. Lab., Agric. Res., SEA,

USDA, Savannah, GA 31403) **Rapid cleanup procedure for gas-liquid chromatographic determination of chlorpyrifos-methyl residues in cat food.** *J. Assoc. Off. Anal. Chem.* 64(5): 1227-1231; 1981 (2 references).

A simple and rapid gas-liquid chromatographic (GLC) method was developed for the determination of residues of chlorpyrifos-methyl in dry cat food. Cat food fortified with chlorpyrifos-methyl was extracted with acetone and cleaned up on a modified acetonitrile-on-Florisil partitioning column. The chlorpyrifos-methyl was determined by GLC with a flame photometric detector. Results were compared with those for known standards that had undergone the same cleanup procedure. The quantitative electronic integration limit of determination was 0.03 ppm. Average recoveries for 5 analyses at fortification levels from 0.052 to 51 ppm ranged from 90 to 102% and averaged 97%. (Author abstract by permission)

81-3579. Ugland, K.; Lundanes, E.; Greibrokk, T.; Bjorseth, A. (Dep. Chem., Univ. Oslo, Oslo 3, Norway) **Determination of chlorinated phenols by high-performance liquid chromatography.** *J. Chromatogr.* 213(1): 83-90; 1981 (11 references).

The separation of mono-, di-, tri- and tetrachlorinated phenols and pentachlorophenol (PCP) has been investigated by high-performance liquid chromatography using 3 different systems, adsorption chromatography on silica and reversed-phase chromatography on a polar bonded phase (aminoalkyl) and a non-polar bonded phase (octadecyl). A satisfactory group separation as well as a satisfactory separation of isomers could not be obtained by adsorption chromatography on silica. A reasonable separation of isomers was obtained with amino columns, but the group separation was not satisfactory. The octadecyl columns were superior with reference both to separation of groups and isomers within these groups as well as to stability and speed of analysis. A mixture of 19 different phenols was resolved on a C_{18} column with a 30-min linear gradient of 56-80% methanol and 44-20% of 0.02 *M* KH_2PO_4 (pH 4.0). (Author abstract by permission)

81-3580. Kastl, P. E.; Hermann, E. A.; Braun, W. H. (Toxicol. Res. Lab., Health & Environ. Sci., Dow Chem., Midland, MI 48640) **Quantitative determination of 1,2-dibromo-3-chloropropane in whole rat blood and drinking water by gas chromatography.** *J. Chromatogr.* 213(1): 156-161; 1981 (5 references).

A gas chromatographic-electron capture detection (GC-ECD) method for the determination of DBCP in whole rat blood is presented. A parallel method for drinking water analysis is also presented. DBCP was extracted from blood samples with toluene containing the internal standard, HCE. Samples were then vortexed for 1 min and centrifuged for 1 min. The GC column was injected with 2 μl of the organic layer. Water samples were extracted with toluene, shaken for 30 min, and 2 μl of the organic layer was injected onto the GC column. Any samples containing $> 1.14 \times 10^2$ ng/ml DBCP were diluted to below the detector range of 2.28×10^{-1} to 1.14×10^2 ng/ml. Recoveries from blood were 92.6-102.4%; the mean recovery for the entire concentration range (2.28×10^{-1} to 2.28×10^4 ng/ml) was $96.7 \pm 3.0\%$. The mean recovery from water was 95.9 $\pm$ 2.6% for the range 1.14 to 1.14×10^3 ng/ml.

81-3581. Wilson, A. M.; Bushway, R. J. (Dep. Food Sci., Univ. Maine, Orono, ME 04469) **High-performance liquid chromatographic determination of azinphos methyl and azinphos methyl oxon in fruits and vegetables.** *J. Chromatogr.* 214(1): 140-147; 1981 (14 references).

An HPLC method is presented for the analysis of residues of azinphos-methyl and its oxygen analogue in tomatoes, green beans, potatoes, apples and blueberries. Samples were spiked at 0.16 ppm. Retention times for the 2 compounds were 4.05 cm for azinphos-methyl oxon and 8.9 cm for azinphos-methyl. The azinphos-methyl peak was well resolved in all commodities, but the azinphos-methyl oxon peak was not. While baseline separation was not achieved in any of the products spiked at the 0.16 ppm level, it was possible to quantitate levels in green beans, potatoes, and apples at that level by drawing the baseline diagonally. At higher spiking concentrations, both compounds were well resolved with no interferences. Total analysis time, including sample preparation, was $\sim$ 45 min. Reproducibility and extraction efficiency were good with recoveries ranging from 75.2 to 105% and coefficients of variation from 2.4 to 15% with only 1 coefficient above 8.9%. Limits of detection for the method were determined to be 0.16 ppm for azinphos-methyl in all the food products analyzed and 0.4 ppm for the oxygen analogue. Thirty-nine commonly used pesticides were injected to determine if they co-chromatographed with azinphos-methyl or the oxygen analogue. None of these interfered with the oxygen analogue, but captan, promecarb, and famphur (ENT-25644) do interfere with azinphos-methyl if they are present in the samples at certain concentrations.

81-3582. Olynyk, P.; Budde, W. L.; Eichelberger, J. W. (Environ. Monit. & Support Lab., Off. Res. & Dev., US EPA, Cincinnati, OH 45268) **Simultaneous qualitative and quantitative analyses. I. Precision study of compounds amenable to the inert gas-purge-and-trap method.** *J. Chromatogr. Sci.* 19(7): 377-382; 1981 (5 references).

Data are presented which define the scope and limitations of simultaneous qualitative and quantitative analysis in terms of the precision of the quantitative analysis. The test problem selected was the measurement of some halogenated C_1-C_3 compounds and substituted benzenes in water solutions. Test compounds were purged from water solutions with an inert gas, trapped on on ad-

sorbent, and thermally desorbed into GC/MS system. The method efficiency for the purge-and-trap method is defined as the peak area after the direct injection of an identical amount of the same compound into the chromatograph. The average of mean method efficiencies of the halogenated C_1-C_3 compounds was 71%; the corresponding figure for the substituted benzenes was 77%. Because of the < 100% efficiencies, the standard method of calibration adopted for use with the purge-and-trap procedure is to submit concentration calibration standards to the compiete purge-and-trap GC/MS analysis with the identical conditions used for the environmental samples. The relative standard deviations for repetitive analyses were in the 2-13% range, depending on the compound subgroup and whether the internal or external standard method of calibration was employed.

81-3583. Kao, C. (Farmland Ind. Inc., Hutchinson, KS 67501) **Determination of aluminum phosphide in fumigants.** *J. Food Sci.* 46(5): 1632-1634; 1981 (6 references).

A new method for the determination of phosphine (aluminum phosphide) is presented. The method requires only a simple gas reactor, and can be readily adapted for use in most laboratories. The major piece of equipment is a small glass reactor for phosphine generation and absorption. Phosphide-containing fumigants are mixed with water to release phosphine gas, which is then oxidized to phosphate by permanganate. The phosphate formed is determined by the gravimetric quinolinium molybdophosphate method. Total reaction time is ~ 16 hr.

81-3584. Sen, G.; Mulchandani, N. B.; Vyas, A. V. (Bio-Org. Div., Bhabba Atomic Res. Cent., Trombay, Bombay 400085, India) **Reversed phase high pressure liquid chromatographic separation of precocenes-I, -II, antijuvenile hormones and their derivatives.** *J. Liquid Chromatogr.* 4(9): 1569-1576; 1981 (4 references).

High pressure liquid chromatographic separation of the antijuvenile hormones precocene-I and precocene-II and their derivatives (dihydroprecocene- I, precocene-I dimer, and precocene-II dimer) was done with different eluent concentrations of MeOH:H_2O. The precocenes and their derivatives separated with good resolution. Good separation was achieved with MeOH:H_2O (3:1) and with CH_3CN:H_2O (3:2) as the eluent system. The variation of retention time versus the polarity of the eluent was also investigated. It was determined that the capacity factor decreased with increasing concentration of methanol in the eluent.

81-3585. Papadopoulou-Mourkidou, E.; Iwata, Y.; Gunther, F. A. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Analysis of the carbamate insecticides aldicarb and carbaryl in formulations utilizing a high-performance liquid chromatographic system with an on-line infrared detector.** *J. Liquid Chromatogr.* 4(9): 1663-1676; 1981 (9 references).

The application of a high pressure liquid chromatography-infrared system for the analysis of carbamates is demonstrated through the analysis of the commonly used carbamate insecticides aldicarb and carbaryl. The HPLC system, operated in the normal phase with a silica gel column, and an on-line infrared detector has been demonstrated to be an easily operated, trouble-free system, and has been successfully applied for the analysis of aldicarb and carbaryl in formulations. No interference from the formulation coextractives was present. The selected mobile phase combinations are relatively transparent in the 5.7 and 5.75 μg region of the infrared spectrum where these carbamates show their strongest absorption band and still have the proper strength and selectivity to separate and elute the analyzed carbamates in < 6 min. No statistically significant differences were found in the results obtained for the calibration methods used.

81-3586. Zor'eva, T. D. (Author address not given) **Povedenie Aktellika na ovoshchnykh kul'turakh v teplitsakh. [Behavior of Actellic on vegetable crops in hothouses.]** *Khim. Sel'sk. Khoz.* 19(7): 46-47; 1981 (Russian).

A 0.2% solution of Actellic (pirimiphos-methyl) was applied to vegetable crops, and residues were determined using thin layer chromatography. Pesticide residues on cucumbers 20-36 hr after treatment had decreased by ~ 50% from the initial level; residues on tomatoes had decreased by 15-20%, and on sweet pepper virtually no decrease was noted. Evaporation from the surface of the soil and plant and condensation on fruit occurs. Actellic is fixed in the cuticle of the rind and partially penetrates into the flesh; however, 95% is concentrated in the rind. It is recommended that Actellic should be used on enclosed soil in the form of a 50% concentration of emulsion at a dose not exceeding 10 kg/ha for southern regions of the USSR and 3-6 kg/ha for northern.

81-3587. Sheinina, R. I. (Cent. Asiat. Res. & Rated-design Inst. Food Ind., Taskent, USSR) **Opredelenie trikhlorfenolyata medi v semenakh khlopchatnika i khlopkovoi shelukhe metodom tonkosloinoi khromatografii. [Determination of copper trichlorophenolate in cottonseeds and cotton hull using thin layer chromatography.]** *Khim. Sel'sk. Khoz.* 19(7): 56; 1981 (2 references) (Russian).

A thin layer chromatographic method was proposed to determine copper trichlorophenolate (CTCP) (a component of phenthiuram) in the presence of hexachlorocyclohexane (BHC) and TMTD (thiram) in cottonseeds and

seed hulls with an accuracy of 0.2 mg/kg and 0.1 mg/kg, respectively. After petroleum ether extraction of seeds, filtration, and re-extraction with benzene, chromatography was performed using *n*-hexane. Chromatograms were developed with silver nitrate. TMTD and BHC were not detected.

81-3588. Shustrov, V. S.; Zelenina, M. F.; Kulintsova, E. V. (All Union Res. Inst. Plant Prot., Leningrad, USSR) **Khromatograficheskoe opredelenie lenatsila i piramina v vode, pochve i sakharnoi svekle. [Chromatographic determination of lenacil and pyramin in water, soil and sugar beet.]** *Khim. Sel'sk. Khoz.* 19(7): 57-58; 1981 (5 references) (Russian).

A method was proposed for determining lenacil and pyramin (chloridazon) based on extraction with an organic solvent, purification, and thin layer chromatography. The method is specific; the presence of Na-trichloroacetate (TCA) and ronit (cycloate) does not interfere. On the bright yellow plate, lenacil is revealed as a lilac-colored spot with R*f* 0.63-0.68 and pyramin, a blue spot with R*f* 0.40-0.45. The lower limits for determining the herbicides are: for water, 0.025 mg/l; for soil, 0.1 mg/kg; for root crop, 0.1 mg/kg; for beet tops, 0.2 mg/kg.

81-3589. Fedotova, I. V.; Drozdov, V. A.; Valyaev, V. V.; Gordievskii, A. V. (D. I. Mendeleev Moscow Inst. Chem. Technol., Moscow, USSR) **Potentsiometricheskoe opredelenie DNOK v vode. [Potentiometric determination of 2,4-dinitro-*o*- cresol in water.]** *Khim. Sel'sk. Khoz.* 19(7): 58-59; 1981 (3 references) (Russian).

A method for determining 2,4-dinitro-*o*- cresol (DNOC) in wastewater using an electrode sensitive to 2,4-dinitro-*o*- cresolate ions was proposed. The proposed electrode is characterized by high selectivity: sulfates, chlorides, nitrates, and phosphates may be present at concentrations exceeding 10,000 times the DNOC concentration.

81-3590. Stahr, H. M.; Moore, R. A.; Hsu, W. H. (Vet. Diagn. Lab., Iowa State Univ., Ames, IA 50011) **A comparison of three methods for cholinesterase analysis.** *Microchem. J.* 26(3): 365-374; 1981 (14 references).

Tests were designed to compare three methods of analyzing cholinesterase: the pH Stat, ∂pH, and radiometric methods. For the pH stat and ∂pH tests, mice were injected with 5 µl carbofuran/10 g. As soon as death occurred, blood was drawn from the heart and tested for cholinesterase. Freeze-dried human blood was amended with carbofuran and phorate, and used as a basis for comparison in the radiometric method. The 3 methods are equally sensitive for detecting severe cholinesterase inhibition. The ∂pH method is recommended for routine laboratory screening. The radiometric method requires only small samples of blood (5 µl), and is suggested to be the most efficient for detecting sublethal exposures to cholinesterase inhibitors.

81-3591. Drevenkar, V.; Vasilic, Z.; Stefanac, Z. (Inst. Med., Res. Occup. Health, Zagreb, Yugoslavia) **A test for monitoring traces of cholinesterase inhibitors in surface waters.** *Mikrochim. Acta* 2(1-2): 45-56; 1981 (38 references).

A rapid technique for scanning for organophosphorus pesticides in surface waters is presented. The basis of the test is the reaction-rate cholinesterase assay (with acetylthiocholine iodide as indicator), monitored spectrophotometrically at 42 nm for 2 min. The detection limits are comparable to those of gas chromatography. Colorimetric standards can be prepared for comparison in the field. The standard deviation for a series of determinations of samples ranging from 0 to 100% inhibition was 5.5%, confirming the suitability of the test for the purpose for which it was intended.

81-3592. Nakamura, H.; Yoshimori, K.; Itoh, J.; Takagi, M.; Ueno, K. (Dep. Org. Synth., Fac. Eng., Kyushu Univ., Fukuoka, 812 Japan) **Characterization of trace phenols in water by a spot-test coupled with resonance Raman spectrometry.** *Mikrochim. Acta* 2(1-2): 131-142; 1981 (7 references).

Techniques for characterization of trace phenols in water are discussed. These compounds, including residual carbamate insecticides, are converted into azo dyes by reaction with a 4-sulfobenzenediazonium salt. The subsequently formed dyes were characterized by resonance Raman spectrometry. Comparisons with spot tests indicated that a pesticide detected in pineapple rind was *N*-methyl-1-naphthyl carbamate (carbaryl) or hydrolyzed form, 1-naphthol. This method was successful in the analysis of agricultural chemicals and food preservatives.

81-3593. Tsuji, K.; Horide, F.; Minobe, M.; Sasaki, M.; Shiraga, N.; Hiroaki, O. (Res. Dep., Pestic. Div., Sumitomo Chem. Co., Takarazuka, Hyogo 665, Japan) **Thermal decomposition of *O,O*-dimethyl *O*-(3-methyl-4-nitrophenyl)phosphorothiolate (Sumithion).** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(3): 371-384; 1980 (12 references).

Differential thermal analysis (DTA) measurement of Sumithion (fenitrothion) in nitrogen or helium atmosphere revealed only 2 exothermic peaks. Literature accounts of the DTA diagram of Sumithion in air give 3 exothermic peaks. The first peak disappears in the nitrogen atmosphere and is therefore assumed to have been due to interaction of Sumithion with oxygen. The thermal decomposition mechanism of Sumithion was further elucidated

by evolved gas detection and analysis, ESR spectrometry, HPLC, and elementary analysis. Three main steps emerged corresponding to the 3 exothermic peaks in the DTA diagram of Sumithion in air. In the first step, at 150-190°C, Sumioxon is formed with evolution of sulfur dioxide gas. In the second step, at 210-235°C, dimethyl sulfide gas is evolved when S-methyl-Sumithion and polymetaphosphate is formed. In the third step, at 270-285°C, the phenolic rings are carbonized and S-methyl-bis-Sumithion is formed, with gas as a by-product. In a nitrogen atmosphere, the first step did not occur. The heat of formation of Sumioxon was calculated as 170-180 kcal/mol.

81-3594. Asaka, S.; Seguchi, K. (Ageo Res. Lab., Agrochem. Div., Nippon Kayaku Co., Ageo, Saitama 362, Japan) **[Analytical method of methyl bromide residue in crops by dithiophosphoryl derivatization.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(3): 413-415; 1980 (4 references) (Japanese).

A modified distillation and gas-liquid chromatography procedure for determination of methyl bromide levels in crops is presented. In an earlier procedure, acetone was used, and *O,O*-diethyl *S*-methyl dithiophosphate was produced by sunlight irradiation or by heating in the absence of methyl bromide. Use of *N,N*-diethyl formamide in the place of acetone prevented this from occurring. Recoveries from hay and eggplant fortified at 0.05-0.25 ppm ranged from 75.7 to 87.0%. A detection limit of 0.0003-0.002 ppm was achieved. The drying tube from Malone's apparatus was eliminated and the operation was carried out without excessive cooling of the methyl bromide scavenger reaction tubes.

81-3595. Getz, M. E. (Agric. Res. Serv., USDA, Washington, DC) **Paper and Thin Layer Chromatographic Analysis of Environmental Toxicants.** (Heyden & Son: London): 164 pp.; 1980 (314 references).

This book is of particular interest to those concerned with the analysis of environmental samples for contaminants who do not have access to sophisticated and expensive equipment, and to analysts in developing countries. It contains extensive chromatographic reference data for animal drugs and feed additives, air and water pollutants, pesticides, herbicides, food additives, cosmetics, and natural toxicants. The section dealing with pesticides considers extraction and cleanup procedures, organochlorine insecticides, organophosphorus pesticides, carbamates, arsenicals, herbicides and plant growth regulators, and fungicides. Specific mention is made of the analysis of organochlorine pesticides through their reaction with aromatic amines after exposure to high-intensity UV radiation, the use of Gibb's reagent in the detection of organothiophosphate pesticides, and the reaction of organophosphate pesticides directly with specific enzymes and substrates on a paper chromatogram to reveal the inhibiting pesticides as blue spots against a yellow background.

81-3596. Mathews, B. L.; Steer, B. D. (Shell Biosci. Lab., Shell Res. Ltd., Sittingbourne, England) **Pesticides, field problems and chemical analysis.** *Span Progr. Agric.* 23(1): 32-34; 1980 (1 reference).

Most problems arising with pesticide products occur as a result of adverse weather conditions at or soon after application, or the incorrect use of the products. Problems such as unsatisfactory pest control or phytotoxic effects on the treated crop often take time to become evident. The analyst must check to determine if the proper amount of active ingredient was actually present in the product applied. Sometimes such a small amount of the product remains that it can not be considered a representative sample. Specific types of phototoxicity observed in the field might aid the analyst in targeting specific contaminants that may be present in the product used. During the production of the chemicals, analysis is extremely important to ensure that a high quality material is produced. Chemical analysis is done in the laboratory with modern analytical methods and procedures that use specialized equipment not easily operated in the field. Sometimes on-the-spot analysis is advantageous, as in the case of animal dip baths; analysis in the field is essential to maintain correct concentrations of the active ingredients in the bath during the dipping process. One method that has been developed for this purpose applies the principles of thin-layer chromatography; the apparatus has been incorporated into a field test kit which can give results in 30 min.

81-3597. Traore, S.; Aaron, J. J. (Lab. Chimie Phys. Org. & Anal. Instrum., Dep. Chim., Fac. Sci., Univ. Dakar, Dakar-Fann, Senegal) **Determination of bromophos residues by fluorogenic labelling with dansyl chloride and thin-layer chromatography.** *Talanta* 28(10): 765-767; 1981 (4 references).

The application of fluorogenic labeling and TLC to the determination of bromophos residue in peanut crops is presented. The bromophos is hydrolyzed and the product, 4-bromo-2,5-dichlorophenol (DBCP), dansylated with dansyl chloride. The fluorescent dansylated BDCP is separated by TLC and detected fluorimetrically. Linear fluorimetric analytical curves are obtained for bromophos weights ranging between 0.5 and 50 ng. The minimum detectable quantity is estimated to be 0.5 ng. The method may be used to recover as little as 400 ng of bromophos residue from 25 g of peanut seeds. The method is highly sensitive, relatively inexpensive, and reliable for determining bromophos residues in peanut crops. Analysis was performed of a 1-kg sample of peanut pods and their seeds; results were comparable to those obtained by gas chromatography. This method is a convenient and simple means of analysis of organophosphate pesticide residues

when sophisticated and expensive instrumentation is not available.

81-3598. Belonosov, V. M. (All-Union Res. Inst. Vet. Sanit., USSR) **Opredenenie gamma-izomera geksakhlortsikloreksana. [Determination of the gamma-isomer of hexachlorocyclohexane.]** *Veterinariya (Moscow)* (6): 23; 1981 (Russian).

A method of determination of the γ-isomer of cyclohexachlorocyclohexane (γ-HCH; γ-BHC; lindane) in hexachloro-creolin emulsions is described. The technique is based on γ-HCH extraction with hexane and gas-liquid chromatography. The limit of detectability was 5×10^{-12} g/sec. The content of γ-HCH was estimated by comparing the peak height for the test sample with the peaks for control samples containing 0.002, 0.005, and 0.01 μg.

81-3599. Tikhomirov, S. M. (All-Union Res. Inst. Vet. Entomol. & Arachnol., USSR) **Otsenka metodov opredeleniya mikrokolichestv DDVF v myshtsakh. [Evaluation of methods of determining microquantities of DDVP in muscles.]** *Veterinariya (Moscow)* (7): 60-61; 1981 (Russian).

The following methods were evaluated for determination of microquantities of the insecticide DDVP (dichlorvos) in rabbit muscle: enzyme agar-diffusion; thin layer chromatography (TLC); the biological assay. The biological and enzymatic methods were more sensitive than TLC. The enzyme method detected smaller quantities than the biological method.

81-3600. Funch, F. H. (Food Technol. Lab., Tech. Univ. Denmark, DK-2800 Lyngby, Denmark) **Analysis of residues of seven pesticides in some fruits and vegetables by means of high pressure liquid chromatography.** *Z. Lebensm. Unters. Forsch.* 73(2): 95-98; 1981 (11 references).

A rapid multiresidue procedure is described that can be used in the routine analysis for pesticides in fruits and vegetable products. Seven pesticides commonly used in Denmark were selected for study: azinophos-ethyl, azinphos-methyl, carbaryl, fenitrothion, parathion-ethyl (parathion), paraoxone (paraoxon), and parathion-methyl (methyl parathion). Each pesticide was sought at 2 levels, one at ∼ half the permissible maximum residue concentration and another at ∼ total permissible concentration. Mean recoveries ranged from 75 to 90%. Coefficients of variation were < 10%. Whenever the concentration found in a product is lower than 50% of the recommended value, the product is acceptable. To minimize the time of analysis using the liquid chromatograph, a fixed UV wavelength was selected for the determination of the 7 pesticides. Absorption spectra showed 2 common absorption maxima, one at 210-220 nm and one at 280 nm. With this method, only minimum cleanup and a simple 1-column isocratic technique are required.

See also 81-3318, 81-3326, 81-3337, 81-3412, 81-3413, 81-3415, 81-3416, 81-3438 *and* 81-3501.

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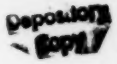
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